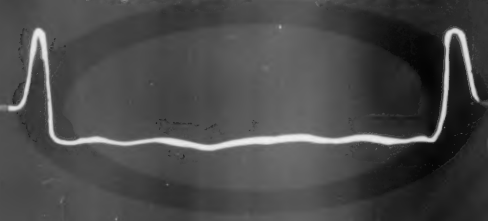
the OIL AND GAS JOURNAL
PUBLISHED WEEKLY FEBRUARY 13, 1961

Important evidence shows . . .



RADIATION SURVEYS CAN FIND OIL

p. 124

The Changes Ahead in Washington

A veteran capital reporter sizes up the new crop of government officials . . . and their potential impact on the oil industry.

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In Val Verde and Delaware basins

Deep tests could po[illegible] gas

p. 54

Canadian oil to mov[illegible]on?

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Secret study advises government

Ask private business to find [illegible] oil

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Prospects for double[illegible]ing in '61

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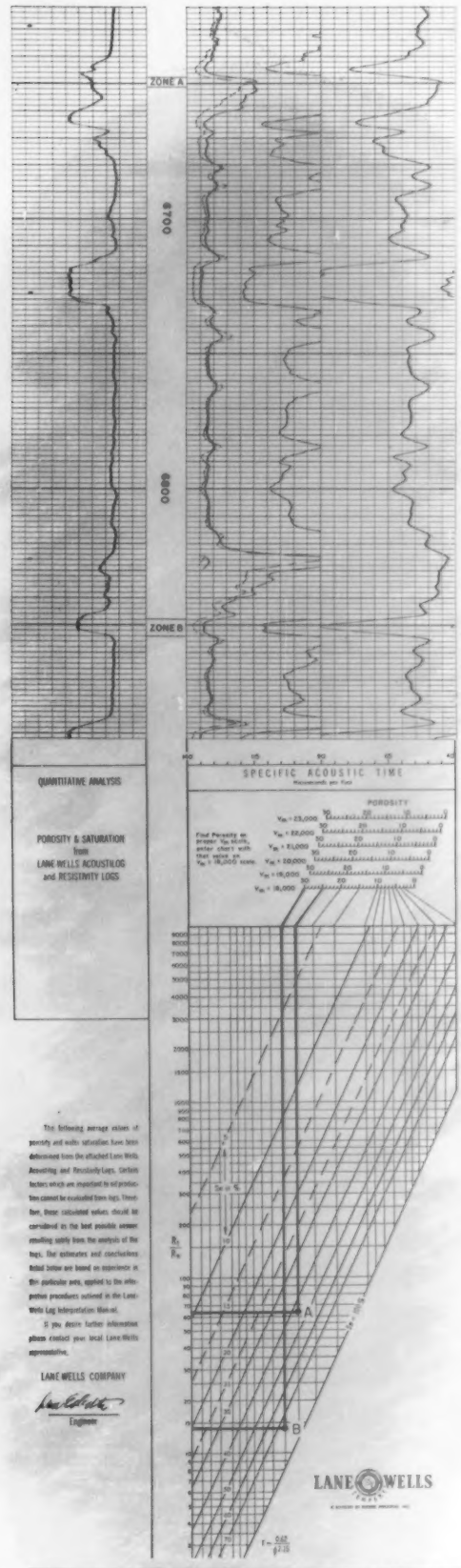

The following average values of porosity and water saturation have been determined from the attached Lane-Wells Acoustilog and Resistivity Logs. Certain factors which are important to oil production cannot be evaluated from logs. Therefore, these calculated values should be considered as the best possible estimate resulting solely from the analysis of the logs. The estimates and conclusions listed below are based on experience in this particular area, applied to the interpretation procedures outlined in the Lane-Wells Log Interpretation Manual.

If you desire further information please contact your local Lane-Wells representative.

LANE-WELLS COMPANY

Engineer

ZONE INTERVAL	NET PAY	R_t	R_w	$\frac{R_t}{R_w}$	AVERAGE POROSITY	AVERAGE WATER SAT.	POSS. PROD.	BBL. OIL IN PLACE/ACRE
6648 to 6651	3	5	0.08	62.5	25%	45%	OIL	3210
6848 to 6854	6	0.05	0.035	14.3	30%	80%	WATER	
to								
to								

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OIL AND GAS JOURNAL
Vol. 59, No. 7

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TECHNOLOGY—OPERATION

Pipelining

Where We Are and What's Ahead in Double Jointing 70

By Paul Reed

Equipment changes in portable field plants using automatic welding are greatly increasing their effectiveness. The technique was used fairly extensively in 1960 and will be applied to a greater extent in 1961.

Refining-Processing

Humble's King Ranch Gas Plant Now in Operation 78

This, the largest gas-processing cycling plant in the U. S., is handling 545 M.M.c.f.d. of gas, 57% of its designed capacity of 950 M.M.c.f.d. Total investment is about $68 million.

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By Jim Zike

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Revamping Cat Cracker Pays off for American Oil Co. 96

By C. T. Nicholson and F. J. Citek

Modifications of the Whiting unit boosted fresh-feed capacity from 40,000 to maximum of 60,000 bbl. per stream day. Coke-burning capacity has increased from 25,000 to 44,000 lb. per hour.

Drilling-Production

Instrumentation, Calculations Can Solve Mud-Pump Problems 74

By Samuel L. Collier

An instrumentation system, developed for laboratory operation, has now been moved into the field to solve pump operating problems. Pump operation can be improved to eliminate knock.

Rotary P.D. Meters Will Work in the Oil Field 82

By R. B. Symon

Shell engineers have used this meter in field testing services and found the results promising. In fact, there are many other possible applications in the oil field.

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General

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By James H. Herbert

Review of safety records at board level means that 10 to 25% improvement in a company's safety record can be made in 1 year.

Middle East Seeks Ways to Use Surplus Gas 95

A bright future is indicated.

The OIL AND GAS JOURNAL Newsletter

Tulsa, Okla.
Feb. 13, 1961

Plan to import Canadian crude into Texas is being talked:

Volume involved would be 100,000 bbl. daily or possibly as much as 200,000 bbl. daily on a 5-year increasing contract.

The plan: Buy Alberta or British Columbia crude, move it over Trans Mountain Pipe Line to tanker terminal at Anacortes, Wash. It would thus enter U. S. free of import quota restrictions.

Tankers would move oil from Anacortes through Panama Canal to refineries on the Texas Gulf Coast.

Keys to the deal are getting a 65 to 75-cent per barrel cut in price of Canadian crude and a tanker rate of 50 or 60 cents a barrel compared with current quotations of 80 cents to $1.

Feelers are being made in round-about fashion by number of intermediaries, brokers, and lawyers. Principals are taking careful precautions to keep identity secret for present.

Aim of negotiations is to lay down Canadian crude at Houston for $2.95 per barrel compared with price range of $2.97 to $3.11 for crude currently reaching that market (p. 62)*.

▲ ▲ ▲

Trend in wildcatting is toward more exploration for gas.

Since 1951, wildcat wells completed as gas producers have risen from 14.5% of all wildcat wells to 25.8% last year.

The trend, however, may not be steep enough considering that gas sales in the last 14 years have jumped 220% and reserves have increased only 70% in same period (p. 49).

Deep-drilling play in West Texas' vast Delaware-Val Verde basin has started on a big scale.

At least a dozen rank wildcats are currently scattered over the region, headed to pre-Pennsylvanian targets ranging down to 20,000 ft. Some already appear to have found possible production (p. 54).

▲ ▲ ▲

New faces, new ideas affecting oil appear in Washington.

The new faces fit a pattern. They are young, eager, aggressive. They are intellectual but also practical realists. But there's few friends of oil in the whole crowd.

---

*Refers to article in this issue giving more details. When no page is given, the item is a Newsletter exclusive.

The danger to the oil industry in the future thus stems from a lack of information on oil by key officials and lack of participation in governmental affairs by oil officials (p. 45).

Advice to nations seeking to develop oil potential: Encourage private financial and technical help from outside.

That's conclusion of Walter J. Levy, New York oil consultant, who has just completed a special study for the U. S. International Bank for Reconstruction and Development.

Private interests, Levy says, can supply the capital and take the risks in exploration and development that politics might prevent a government from taking (p. 65).

Next boss of Petrobras, Brazil's oil agency, may be a geologist and operating oil man.

Word from Rio de Janeiro is that Geonisio Barroso, currently superintendent of Bahia oil fields, has been nominated by incoming President Quadros.

Barroso, a veteran of many years service with both Petrobras and earlier government oil agency, would succeed Idalio Sardenberg.

▲ ▲ ▲

New round of pay boosts in the oil industry may be planned by OCAW delegates in series of regional meetings scheduled in April.

From the meetings will come union bargaining goals for year. Big issue may be whether to reopen contract negotiations for higher pay later this year under wage-reopening clauses. Best bet, however, is that union will stand pat on present pay gains and concentrate on higher 1961-62 pay goals.

A new detergent that won't clog sewage disposal plants has been developed by Shell International Chemical.

It's an alkylate known as Dobane JN, one of a number of alkyl benzenes produced from olefins derived from cracking a selected petroleum base stock. It will be introduced to the United Kingdom market. Full-scale tests in the sewage plant of a large town showed it breaks down under the plant's bacteriological process.

Tetraethyl lead will be produced in Japan for the first time by a joint company now being planned by Ethyl Corp. and Mitsui Chemical.

They plan to produce about 6,500 tons annually which will offset the country's entire present import requirements.

▲ ▲ ▲

Residual fuel-oil import control program is under fresh study. Interior Secretary Stewart Udall is planning to take a hard, close look at the situation personally.

Residual plan has been under sporadic attacks from inception, and criticism continues to flare up. By contrast the controversy over crude oil program has dwindled gradually.

Complaints against increases in fuel-oil prices on East Coast were voiced in Congress last week by Rep. Samuel Stratton, New York Democrat.

He accused oil marketers of "a desire to get all the traffic will bear while the weather stays cold." He told reporters he is asking an investigation by the House commerce committee, Senate antitrust committee and the joint economic committee.

Fuel oil men have moved nearer their goal of a single national association with approval of a merger by boards of National Fuel Oil Council and Oil Heat Institute of America. OHI membership also has voted in favor of the move.

▲ ▲ ▲

New crude pipeline will give British Columbia producers edge in their campaign to take over the 75,000-bbl. daily Vancouver refining market (p. 58).

Approval has been given to Westcoast Transmission for a 500-mile, 12-in. line costing $30 million which will put British Columbia crude into Vancouver. The new line will put British Columbia oil into the Trans Mountain system at Kamloops. Result may be a freezeout of Alberta crude in the market within 3 years.

Some unnatural dislocations already are cropping up under area gas pricing in the Permian basin.

They are sure to get an airing before the upcoming FPC prehearing conference in Midland March 6. The FPC through the meeting hopes to develop a record by which it can determine an appropriate price level for gas sales in the basin.

One situation in southeastern New Mexico is an example of what is happening under area-pricing formula.

A new natural-gasoline plant is being built in a multipay gas area close to an existing plant which is only operating at 25% of capacity. Reason for the uneconomic move is the 2-cent differential in the area-pricing scheme between old and new gas.

Producers connected to the existing plant cannot sell it gas from a new zone. To sell their gas at the new price, producers must sell it under a new contract to a new buyer. Existing plants thus may be hurt under present dual-pricing conditions.

Industry notes: Juniper Oil & Mining plans to drill 40 wildcats in the Nebraska panhandle during next 2 years. First two will be spudded sometime this month...A Paris-based drilling firm, Languedocienne, is moving a rig into Spain to drill for American Overseas Petroleum (Spain), Ltd., in the foothills of the Pyrenees. Spanish roughnecks, now being trained in France, will be used...Humble now has a full-time statehouse man in New Jersey. He's Daniel L. Hussey who has title of government-relations representative...Members of 32 state legislatures are receiving special information supporting laws for compulsory motor vehicle inspections. Safety is the main theme...Sinclair and BP have acquired interests in Richfield's exploration activities in Katalla-Yatataga area of Alaska.

Market Memo

Feb. 13, 1961

Big news in marketing is still the terrific pressure on heating oil, LPG, and natural gas in the chilly eastern half of the U. S.

Distillates moved up generally a half cent in price last week from the Gulf Coast to Maine as heavy demand kept supplies tight.

LPG suppliers also reported heavy movements into all areas.

Gas distributors broke records for deliveries in Chicago area.

Price changes on distillates centered on the East Coast where advances were caused by higher postings earlier on the Gulf, higher tanker rates, strong demand, and tight supply.

Mobil started off the trend. It put the half-cent higher tag on all methods of delivery. Atlantic and Esso then went up only 0.4 of a cent in Baltimore and Philadelphia. Esso also posted the half-cent increase at Baton Rouge, New Orleans, and on the Plantation line. Texaco, Cities Service, and Amoco followed with raises ranging from 0.4 to 0.5 of a cent per gallon.

The East Coast trade reported no industry shortage of heating oil. Barge and truck deliveries often were hampered, however, by ice-clogged rivers and harbors and icy roads. An industry shortage could threaten if severe cold continues the rest of the month.

On the Gulf Coast, buying by majors last week practically cleaned out available No. 2 supplies through March.

Six cargoes were sold at the new 9.5-cent per gallon low. One or two of them were for late February lifting, and the rest for March. About 230,000 bbl. also were sold at West Memphis for down-river movement by mid-March. Price was current one-fourth to three-eighth of a cent off Gulf Coast low.

These sales left only one cargo of No. 2 available in March and it still is not firm. Future spot supplies now will depend on runs.

Supplies on the river also are drying up. Sellers there last week couldn't come up with enough material to fill a firm order for 80,000 bbl. of No. 2.

Tanker rates from Gulf to New York also have reacted upward to the rush of business. They hit ATRS plus 60 on one charter.

Story is about the same on gasoline—nothing moving either on the river or out of Gulf ports. In absence of buying, posted prices remain the same, although stocks continue to rise. Chicago again became a trouble spot with a 2.7-cent cut in tankwagon prices.

Crude price changes: Continental posts an 8-cent higher price on low-gravity asphalt sour crude in the Rockies. About 10,000 bbl. daily of crude in Wyoming and Montana is affected...Leonard reduces price of Wisner field crude 10 cents to $2.85 per barrel and Dwight field 15 cents to $2.80. Both fields are in Michigan.

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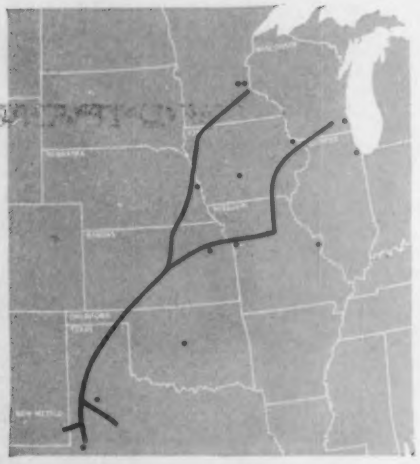
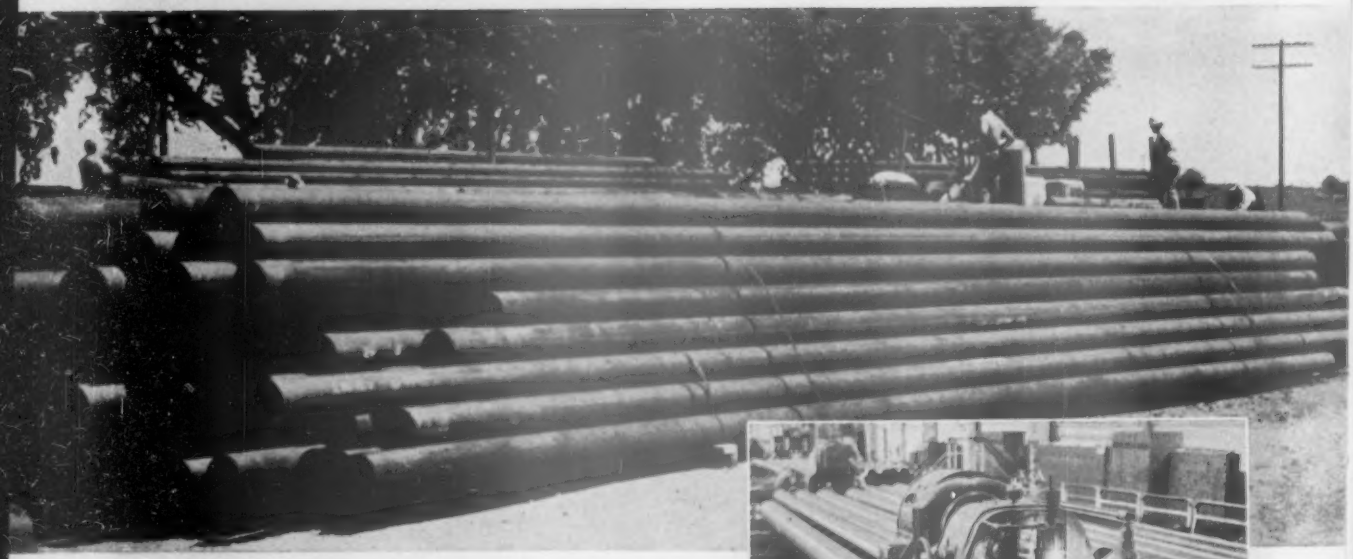
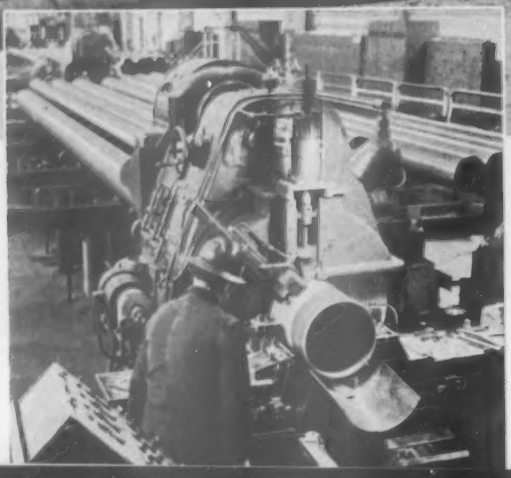
Bethlehem Line Pipe Performs for Mid-America Pipeline



For this 2,200-mile LPG pipeline, Bethlehem furnished some of the longest line pipe on record. Lengths of the 8-in., X52-Grade pipe reached to 62 feet! That's mighty long pipe. And every inch of it is top-quality . . . the kind that keeps pipeliners moving at top speed.



▲ *In a Kansas field, Bethlehem pipe waits for the stringers. Extra-long lengths, squared ends, and accurate bevels mean fewer and faster welds, smooth installation.*



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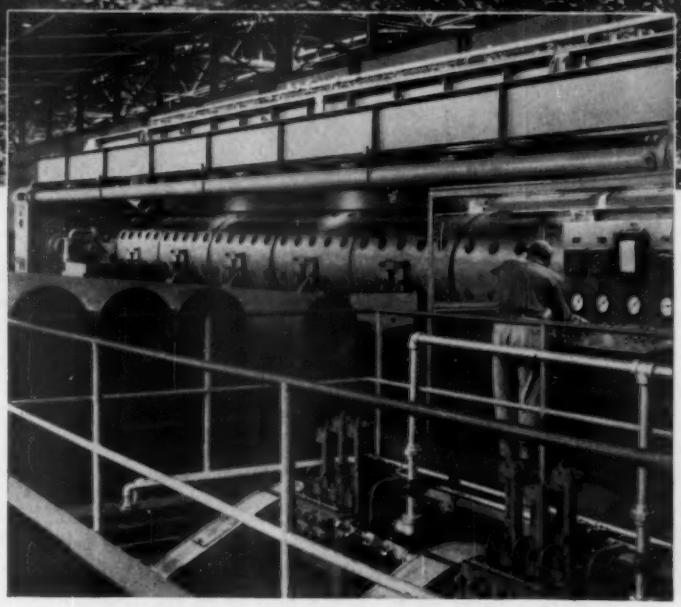
▲ *Williams Brothers Company, Tulsa, engineered and constructed the line for Mid-America Pipeline Company, also of Tulsa.*



Electric Fusion-Weld line pipe *facilities, newly-installed at Bethlehem's Steelton, Pa., plant, turn out pipe from 18 through 42-in., OD, with walls to 3/4-in. in all diameters.* ▶

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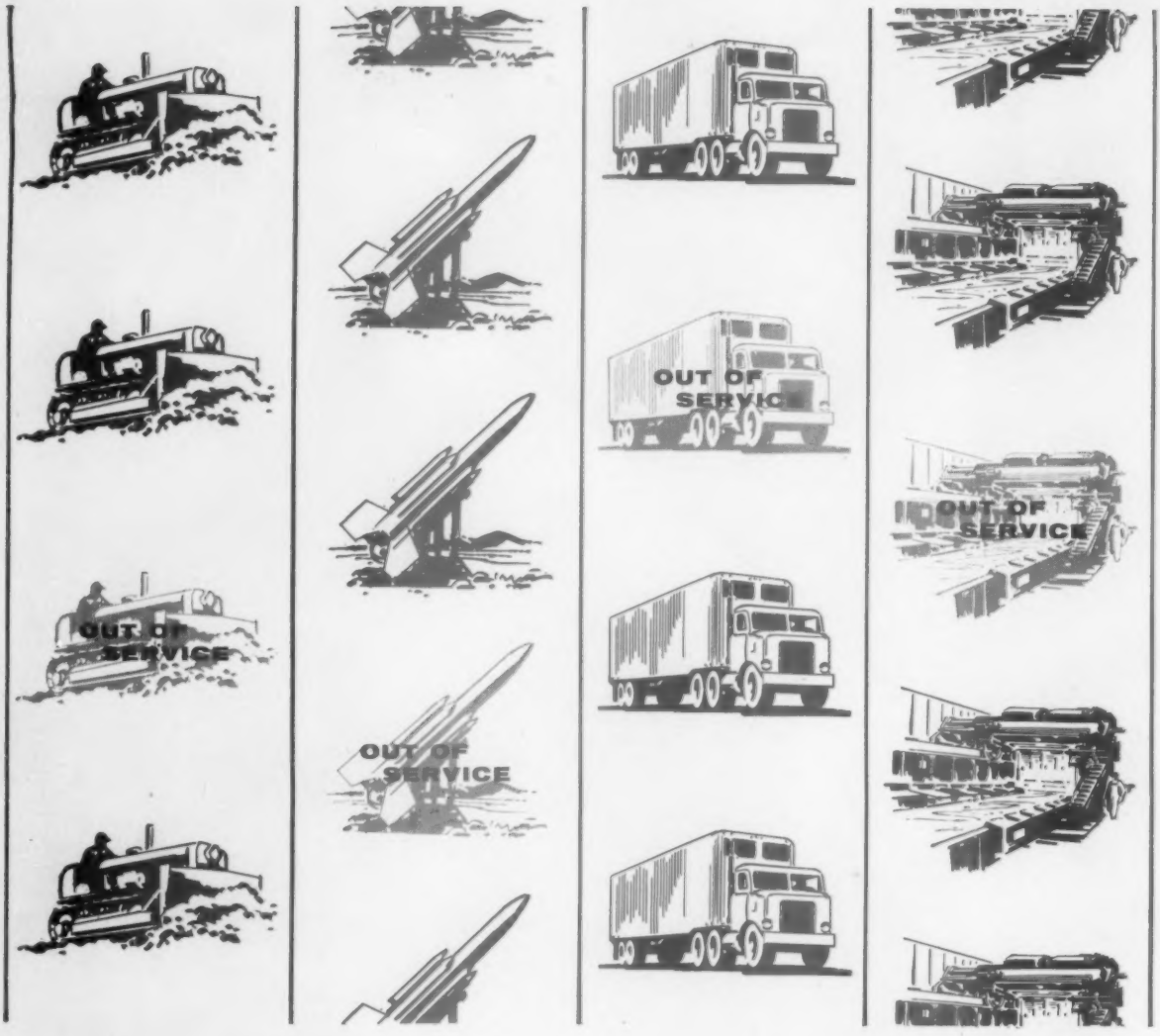

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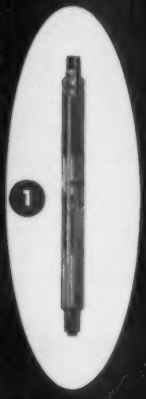

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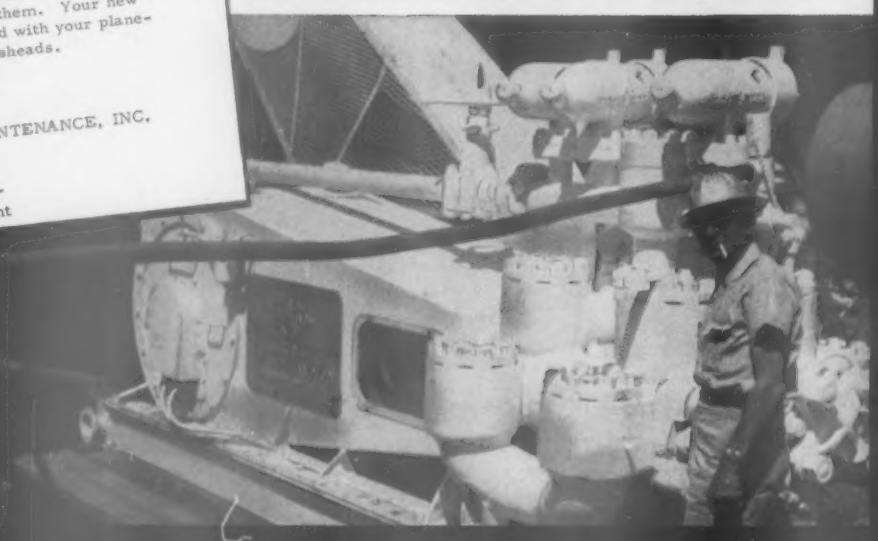


Wheland HP-16000 Planetary Pump owned by Oil Production Maintenance, Inc., on location in the Gulf Coast area.

WHELAND

ROTARY DRILLING MACHINERY

THE WHELAND COMPANY
CHATTANOOGA, TENNESSEE, U.S.A.

DRAW WORKS • SLUSH PUMPS • ROTARIES
CROWN BLOCKS • TRAVELING BLOCKS • SWIVELS

DOMESTIC DISTRIBUTORS: INDUSTRIAL SUPPLY COMPANY, INC.—Main Office: Wichita Falls, Texas • HOUSTON OIL FIELD MATERIAL COMPANY, INC.—Main Office: Houston, Texas.

EXPORT DISTRIBUTORS: LUCEY EXPORT CORPORATION—233 Broadway, New York 7, New York—Broad Street House, London, E. C. 2, England.

Esso Petroleum Company, Limited, 100,000 BPSD refinery at Milford Haven, Wales. Engineering-contractor: Foster Wheeler

The Invisible 100,000 BPSD Refinery

This sky-silhouetted partial view of the new Esso Petroleum Company Limited 100,000 BPSD refinery at Milford Haven certainly appears to be quite visible. But the fact is that it is virtually invisible from the nearest highway or from the nearby sea. For important economic and civic considerations, the installation was in effect designed *into* the rolling hills of Milford Haven. Fully automated, the refinery produces gasoline and fuel oil in six process sections. As many as ten motor fuel components may be blended by remote control.

Shown above on the left are the crude distillation facilities and on the right, the powerformer processing area. A 500 million Btu/hr Foster Wheeler direct-fired heater . . . one of the largest of its type . . . serves the crude distillation unit. Facilities also include a T-shaped marine terminal extending 3500 ft. from the shore reaching a water depth of 50-70 ft. to accommodate the largest super-tankers.

To integrate this "grass roots" refinery with surrounding communities, over 75 storage tanks and spheres were placed on terraces and heater stacks were breeched into three 300 ft. main stacks to eliminate air pollution. To guard against water pollution, a separator with a 10 million gallon pond was constructed.

As in more than 800 process installations before this one, Foster Wheeler's engineering and construction services have provided the experience, ingenuity and technical competence needed to meet unusual project requirements. Here is more evidence of Foster Wheeler's ability to serve you, whatever your requirements . . . large or small . . . anywhere in the world.

Heat Engineered products, plants and processes . . . for the world's industrial progress.

FOSTER WHEELER

NEW YORK TORONTO LONDON PARIS MILAN TOKYO

GOODYEAR

NEWS! ONLY V-BELTS BY GOODYEAR

to give you sets matched in length to pull together

What's more, Green Seal V-Belts give you—

True dimensional stability for the life of the belt—built in through the use of shrink- and stretch-resistant 3-T Process Cord or airplane-type steel cable.

Mildew-inhibited construction for protection in damp operating conditions.

Widest selection from the most complete V-belt line anywhere.

Ready availability from distributor stocks in every part of the country.

Technical assistance whenever it's needed from a qualified expert, the G.T.M.—Goodyear Technical Man.

For the best buy in V-belts call your Goodyear Distributor. Or write Goodyear, Industrial Products Division, Akron 16, Ohio.

Lots of good things come from GOODYEAR

GREEN ✿ SEAL ARE CODED TO 1/32"...

perfectly for longer, more trouble-free service

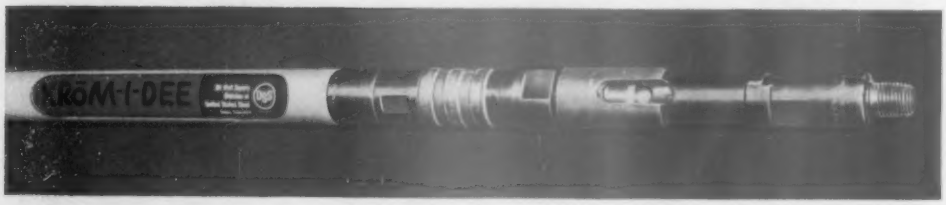
LENGTH-CODING GREEN SEAL V-BELTS TO 1/32"—NOT JUST 1/10", LIKE MOST BELTS—takes this ultra-precision machine. Only Goodyear has this type equipment, which is set by means of fine tolerance steel templates to insure accuracy. Machine readings are in the actual code numbers used to eliminate errors.

Green Seal—T. M. The Goodyear Tire & Rubber Company, Akron, Ohio

YEAR INDUSTRIAL PRODUCTS

Looking for lower lifting costs? Try one of these "Oilwell" Pumps!

NITRILINE is a new, popular-priced alloy-steel barrel designed for over 80% of today's wells. "Oilwell's" patented Nitrocycle hardening process gives it a hard and uniform inner surface, with an extra tough outer shell. This barrel resists both severe abrasion and mild corrosion.



KROM-I-DEE has an extremely hard inner chrome coating which withstands sweet corrosive fluids in carbon dioxide wells and resists abrasion in very sandy wells. Can also be furnished with chrome inside and out.

HI-BRIN: This extremely hard barrel metal is designed for severely corrosive, sour well fluids. Inside wall is nitrided by patented process after finish honing to assure accurate dimensions and even depth of hardness.

SILVERLINE is for wells which have no serious corrosion or abrasion problem. Honed seamless steel tubing is internally coated with antigalling protective compound which allows plungers to be closely fitted.

Oil Well Supply Division of United States Steel

USS

These one-piece "Oilwell" pump barrels with quality fittings are available in most A.P.I. sizes and lengths at pump shops associated with Oil Well Supply stores. You'll appreciate the cooperative service offered by the experienced subsurface representatives who man these shops.

USS, "Oilwell", NITRILINE, KROM-I-DEE, SILVERLINE and HI-BRIN are registered trademarks

Executive Offices—Dallas, Texas
Export Office—30 Rockefeller Plaza, New York 20 N. Y

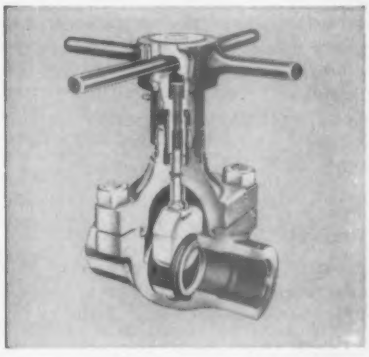
"It's a good feeling to know we have Edward Mudwonder Valves on our #10 rig"

Johnny Sharon, Drilling Superintendent for the Power Rig Drilling Company of Lafayette, Louisiana, has had a lot of experience with Edward Mudwonder valves. Recently we talked to Johnny at Land Rig #10.

"As far as we know," Johnny said, "our #10 rig is the most powerful rig in Louisiana, and it's as versatile as a rig can be. We can drill competitively at anything from 12,000 to 25,000 feet because the rig is designed for versatility, and the equipment on it is selected for rugged, dependable duty. Mudwonder valves give us just that kind of service.

"We have replacement gates and seat inserts on hand, but it's a good feeling to know that we probably won't have to use them. My experience with Mudwonder valves on this new rig bears out the experience I've had on other rigs. That's why #10 is an all-Mudwonder rig, from mud tanks through stand pipe."

This confidence in Edward Mudwonder valves is found wherever you go in the drilling fields. Mudwonder valves are built in 2″, 3″ and 4″ sizes, with screwed or flanged ends, for 2000 psi WP (4000 psi test) and 3000 psi WP (6000 psi test) service and in 2″ size for 5000 psi WP (10,000 psi test) service. See your favorite oil field supply store, or write Edward Valves, Inc., East Chicago, Indiana. Subsidiary of Rockwell Manufacturing Company. 6018



EDWARD STEEL VALVES
another fine product by
ROCKWELL

NOW HEAT STORAGE TANKS WITHOUT STEAM

Economical Brown Fired Fintube Immersion Heater

Short on steam? Need additional boiler capacity? Avoid the expense of adding more boiler capacity, piping, insulation . . . plus acquiring condensate and feedwater problems.

Brown Fired Fintube Immersion Heaters heat asphalt, Bunker "C" oil, and other liquids in tanks for pumping, storage, blending, or loading . . . *without steam!* Low in initial cost and high in operating efficiency, fired immersion heating by Brown is the most economical method of tank heating. Not limited by steam temperatures, Brown Fintube Immersion Heaters can heat to any desirable temperature above those possible with steam. Two standard sizes, 10″ for 1,250,000 BTU/hr. and 8″ for 750,000 BTU/hr. Higher capacities by using multiple units. Gas or oil fired, with or without automatic control. Write for Bulletin 410, Brown Fintube Company, 300 Huron Street, Elyria, Ohio.

PERFORATED FINTUBES KEY TO PERFORMANCE

Perforated Fins provide increased surface that lowers metal temperatures and increases efficiency. Perforations permit circulation around and through the fins, accelerating thermal currents. This improved circulation prevents stratification of material, minimizes fouling of fintube, and reduces sedimentation.

A Complete Line of Tank Coils

Brown Fintube makes a complete line of steam and direct fired coils for all types of tanks. Write for Bulletin 300 and 410.

HEAT EXCHANGE SURFACE
BROWN FINTUBE
HEAT TRANSFER PRODUCTS

BROWN FINTUBE

SYMBOL OF EFFICIENCY IN HEAT TRANSFER PRODUCTS

HOKE **Flow Sheet** 3

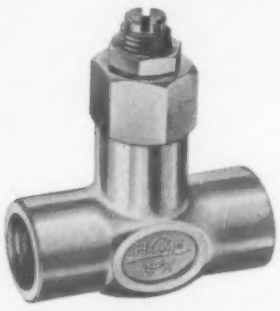
HOKE REPORTS ON FLUID CONTROL

WE'VE TOSSED A NEW BALL INTO AN OLD GAME

How Do You Gauge Protection?

Not that we're trying to put an end to our pressure gauge business, but the new Hoke gauge protector will save you quite a bit of money on gauge repairs and replacement. It will help soothe the savage temper of your maintenance man, which might be even more important.

The new 530 Series gauge protector prevents sudden pressure surges from damaging costly gauges. Mounted conveniently, and directly between the pressure source and the gauge, it can be set for any pressure protection point between 30 and 1000 psig and will handle inlet pressures to 3000 psig. Minimum burst pressure is 9000 psig, so you have a



good safety margin. Its widespread popularity among maintenance men is due to the fact that it does not have to be re-set when the pressure drops below the protection point.

Those more interested in technicalities should read this: The temperature range is −10° to +200° F, and the unit is usable in any clean gaseous service compatible with brass and Buna-N. It weighs only 5¼ ounces, and measures 1⅞ inches from inlet to outlet. Both ends are ¼ NPT female connections, so no adaptors or connectors are necessary for installation.

Specs are available, whatever your reason for wanting them—Write!

SEE OUR CATALOG IN SWEETS PRODUCT DESIGN FILE

The technique of molding polyvinyl chloride into ball valve parts is old hat. Even the unplasticized compounds of type I PVC have been kicked around for a while (with minor successes). But until now, no one has booted the ball for a goal.

Perseverance, determination, and the pursuit of economic reward have prompted us to offer a line of ball valves molded of the toughest grade of type I, unplasticized PVC. There are no foreign agents to contribute to a corrosive demise, even in most caustic services. It even meets the proposed new ASTM specification and has a tensile strength of 8500 psi. Those who have had PVC piping problems will profit from the new molding process that gives these Hokes dimensional stability and very high impact strength. Sensitive systems, human and otherwise, are safe from contamination—they're absolutely non-toxic. We've set 140°F. as the operating temperature limit, but occasional excursions to 160°F. won't do any harm.

All standard models are supplied with a concentric hole drilled thru the ball. They can be heat welded, or solvent bonded right in the line. Piping hookup is even simplified by their coupling-like assembly. Your assistant can fit each half of the valve to a pipe end, then reassemble the valve without having to turn the pipe. Pressures to 125 psi are duck soup for these valves.

A maintenance man's delight, they can be cleaned and have their seats changed without leaving the pipe. Their light weight makes them ideal for use on long, unsupported spans of pipe.

Size-wise, we're offering them in ½, ¾, 1, 1½, 2, and 3 inch sizes, all NPT female connections.

You will command the eternal admiration of your colleagues when you install these valves. Be the first to show your rightful status by ordering a shiny new Hoke polyvinyl chloride ball valve. If pride of ownership hasn't motivated you at this point, the mere fact that you are behind the scientific times should move you to find out more.

It isn't necessary to tell us why you want the additional information. Just check the coupon below. We'll forward the facts in a plain, brown envelope.

WHAT'S NEW FROM HOKE?

Lots of things have been happening at Hoke. To be sure you're up to date on these developments in fluid control see your nearest distributor. He'll have something new for you every other month this year.

Hoke's Performance Guarantee — *Every Valve Leak-Tested!*

HOKE, INCORPORATED
63 Piermont Road, Cresskill, N. J.

Send me complete information on the Hoke products checked below:

- ☐ PVC Ball Valves
- ☐ 530 Gauge Protectors
- ☐ Flow Sheet
- ☐ "What's New"
- ☐ Complete Catalog GC 960

NAME _____ TITLE _____

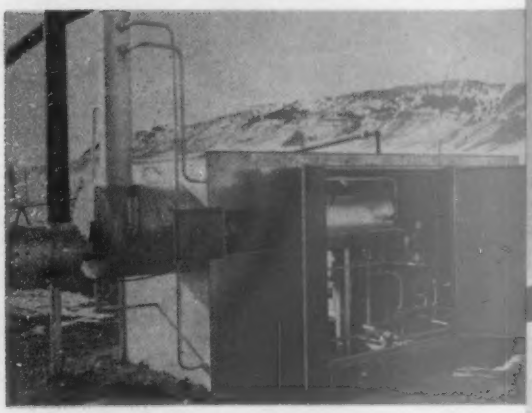
COMPANY _____

ADDRESS _____

CITY _____ STATE _____

This ESKIMO Dehydrator is located in the Big Piney Field, Western Wyoming.

DEHYDRATION till Hell freezes over



with ESKIMO

The ESKIMO — BS&B's Economy Glycol Dehydrator — is a self-contained unit, housed and protected against extremely low ambient temperatures.

This unit has 3-phase resolution of the well stream and 65° dewpoint depression of effluent gas. It is equipped with flame arrestors for maximum safety against fire hazards.

ESKIMO is available in 2 MMSCFD and 4 MMSCFD units with 2 or 3-phase integral scrubbers, and operates on an unattended basis.

Ask your BS&B man about ESKIMO or write to Black, Sivalls & Bryson, Inc., Dept. 1-A2A, P. O. Box 1714, Oklahoma City, Oklahoma.

BS&B

BLACK, SIVALLS & BRYSON

OKLAHOMA CITY • EDMONTON • LONDON • PARIS • THE HAGUE

WAGNER®
MOTORS
AT
WORK

power to pump petroleum

Special Wagner® oil well motors consume fewer kilowatts per barrel pumped

Positively. Yet they cost less to buy. For Wagner® DP-6 motors are engineered specifically for oil well pumping. They have electrical characteristics that permit "close motoring." Their high torque assures positive breakaway and acceleration for walking beam sucker-rod drives in any climate. Their high slip lets them slow down at peak load so the flywheel of the pump can deliver part of its stored energy to the load. As a result, these motors do consume fewer kilowatts per barrel pumped without sacrificing efficiency and dependability.

Particularly recommended for use in automatically controlled leases, Wagner DP-6 motors are built in 6-pole ratings of 3 through 75 hp. They are compact and drip-proof . . . protected against rain, sand, sleet and snow. Their rugged cast-iron frames and endplates bar corrosion . . . conduit boxes are moisture-proof and dust-tight. Ventilating openings are screened to keep out animals and wind-blown debris. Your Wagner Sales Engineer can show you how these motors, and specially designed pole type matching service transformers can provide even greater economies for your installations. Write for Bulletin MU-243 for full information.

Branches and Distributors in all Principal Cities

Wagner Electric Corporation

6389 PLYMOUTH AVENUE, ST. LOUIS 33, MISSOURI

WM61-2

ANOTHER BEAIRD FIRST

A completely packaged 10,000,000 cf/d gasoline plant

Antelope Gas Products' Harry P. McClintock (Managing Partner) won out over severe Nebraska weather and an isolated location with his plan for a factory assembled gasoline plant.

Eleven miles north of Kimball, Nebraska is a revolutionary new 10,000,000 cf/d gasoline plant (capability 75,000 gallons liquid products) whose speed and economy of installation and fabrication may set a new trend in design. Conceived by Harry P. McClintock, Managing Partner of Antelope Gas Products, the prefabricated plant overcame the handicaps of a location with severe winters, limited construction weather and a shortage of skilled local labor.

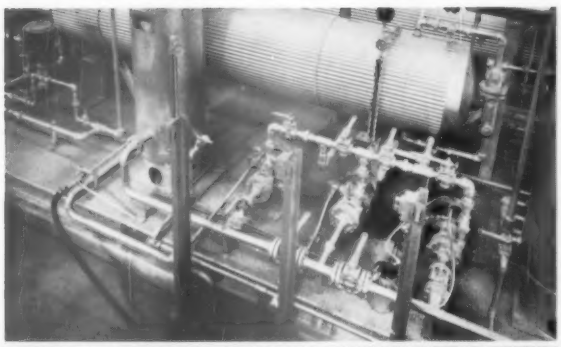
A major breakthrough in unified engineering between process designers and fabricators, the plant went on stream in less than three and a half months from the day of ground breaking. This amazing record was achieved by having the complete facility factory assembled, tested, skid mounted and shipped to location ready to go on stream with only interconnecting piping and outside of the building items left for final assembly at the job site.

Process engineering and field installation was performed by O. L. Olsen Company, Inc., with the J. B. Beaird Company, Inc., serving as the single source of responsibility for engineering assembly, purchasing and fabrication of pressure vessels and packaged plant components.

The entire operation is built around eleven skid mounted units. Three of these are 660 horsepower Beaird-Ingersoll-Rand packaged compressors, with eight skids handling the entire gas processing system. Each skid unit serves multiple process functions which were grouped by Beaird engineers for economy and convenience of interconnecting piping and fabrication.

Packaging of the plant effected major savings for Antelope Gas Products. Much of the normally costly field labor and installation time was eliminated. A simplified building and foundation met all requirements. Hauling and shipping costs were lowered. And should the plant be moved at some future date . . . everything except the foundation can be salvaged.

When your next gasoline plant is still in the planning stage . . . let a qualified Beaird engineer show you the savings possible through factory assembly and packaging of the process functions. *Contact your nearest Beaird representative or write direct.*



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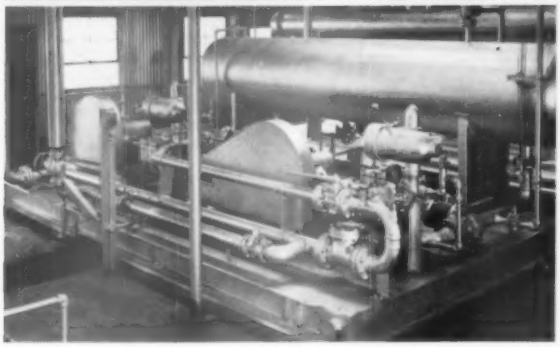

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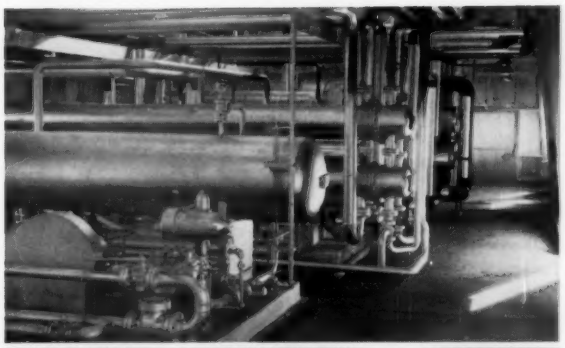


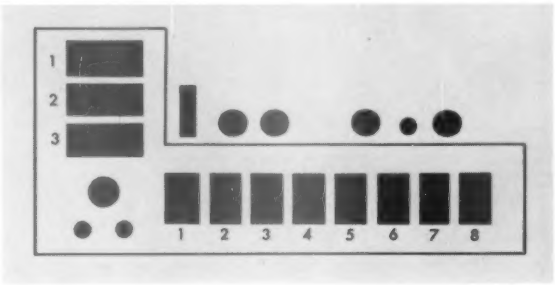
3

4

EACH SKID UNIT HANDLES MULTIPLE PROCESS FUNCTIONS

1 Grouping of components on skids was determined by convenience and economy of piping as well as related process function. Skid 2 contains depropanizer and debutanizer relux accumulators and their pumps. Not shown, but overhead on the skid, are the condensers. Other units include a stripping steam generator and a depropanizer reboiler.

2 Lean oil pumps, surge tank and pulsation dampeners are mounted on skid 5.



PACKAGING SIMPLIFIED PLANT LAYOUT

3 From the center of the Process building, skids five through eight can be seen. Packaging of the units made possible the clean schematic layout of the entire plant. Interconnecting piping and product lines are located overhead, leaving an uncluttered walkway around all sides of the units. This arrangement promotes safety, simplifies maintenance and encourages good housekeeping.

SINGLE RESPONSIBILITY REDUCED PLANT COSTS

4 Beaird handled complete purchasing, fabrication and engineering assembly of all pressure vessels and skidded plant components. 270,000 gallons of storage and four towers were included in the thirty-three pressure vessels fabricated by Beaird. Unified engineering and purchasing effected substantial savings for Antelope Gas Products.

BUILDING BLOCK PLANT LAYOUT

Economical installation and simplified construction of the plant building were made possible by packaging of the process units. Skids one thru three are 660 horsepower Beaird-Ingersoll-Rand Packaged Compressor Plants. Skids four thru eleven handle all process functions. Four Towers, an oil reclaimer and a process oil tank are located in the ell formed by the compressor and process buildings.

another AMF BEAIRD product

THE J. B. BEAIRD COMPANY, INC.

A subsidiary of American Machine & Foundry Company

SHREVEPORT, LOUISIANA

SALES OFFICES: Shreveport, New Orleans, La. • New York, N. Y. • Tulsa, Okla. Houston and Midland, Texas • Hartford, Conn.

BEAIRD INTERNATIONAL, INC., SHREVEPORT, LOUISIANA

ENGINEERING

NEWS YOU CAN USE ABOUT ENGINE AND COMPRESSOR PERFORMANCE

TEFLON* COMPRESSOR RINGS... for special applications

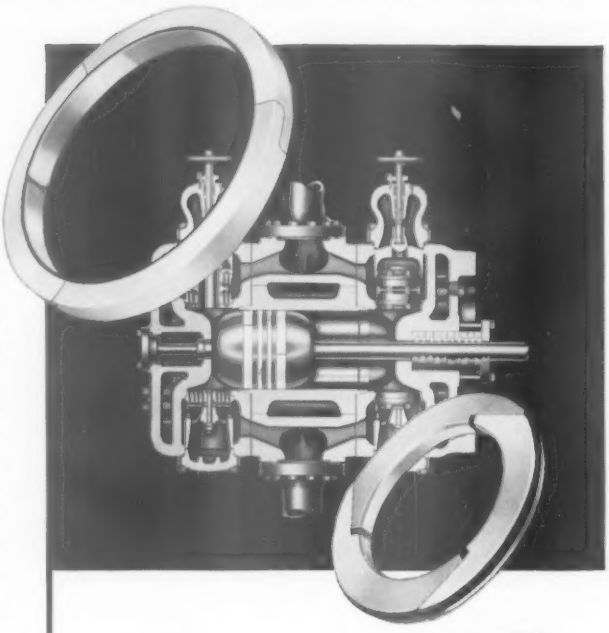
- **TEFLON eliminates or minimizes compressor lubrication**
- **TEFLON is inert to most harmful chemicals and solvents**

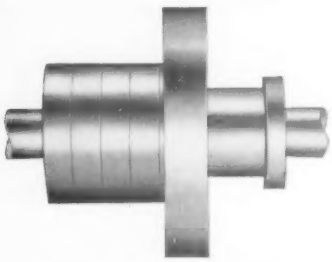
Cook-engineered Teflon packing and piston rings now make it possible to reduce or completely eliminate compressor lubrication. Because of its extremely low coefficient of friction—its toughness and resiliency—Teflon is suitable for both lubricated and non-lubricated ring service.

And just as important, Teflon is completely inert to most chemicals and solvents—thus prevents costly product contamination or other damage which might result with ordinary ring materials.

If your special processing applications demand "borderline" compressor lubrication, you'll want to investigate Cook's Teflon rings. You can get them any size. And they are available in many special Teflon blends, depending on your application. Ask a C. Lee Cook representative to give you the details.

**Teflon is a du Pont product of thermoplastic tetrafluorethylene resin.*





NEW PACKING DESIGN TAKES HEAT OFF TEFLON RINGS

This unique packing design now being developed by Cook keeps Teflon rings cool! It is a new idea for application where Teflon's qualities are needed, but where normal operating conditions develop too much heat for conventional designs.

SEND FOR FREE 6-PAGE TEFLON BOOKLET

If you would like more complete information about new Teflon packings and Teflon piston rings for your specific applications, just write: C. Lee Cook Company, 934 South 8th Street, Louisville 3, Kentucky.

C. LEE COOK

DIVISION OF DOVER CORPORATION

Rings and Packings Since 1888

LARKIN WAS FIRST
to put fittings in the quality class

The uniformity and quality that you find in Larkin Fittings today is the result of more than 25 years of continuous improvement and upgrading of these specialty products.

Quality made Larkin the leader, and you can buy . . . or sell . . . Larkin Fittings with full confidence that they are the finest fittings made.

LARKIN PACKER COMPANY

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WAXAHACHIE, TEXAS

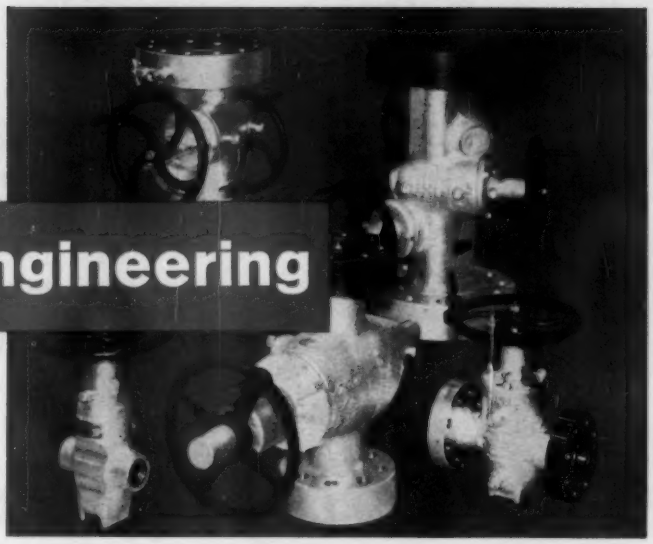
LARKIN LEADERSHIP HAS BEEN EARNED BY YEARS OF DEPENDABLE PERFORMANCE

LARKIN
...Through Your Supply Store

NOW

TOTAL Valve Engineering

W-K-M MAKES REPAIR EASIER



Top left to right: Integral Dual Completion Gate Valve; Integral Triple Completion Gate Valve. *Bottom left to right:* Recessed Body Gate Valve for Triple Completions; Balanced Stem Gate Valve; Standard Production Gate Valve.

Valves designed for fast on-line overhaul prevent major production losses

In many installations, W-K-M Gate Valves have *never* needed overhaul. But when repair *is* needed, W-K-M Valves are designed so *any* internal part—packing, stem, gate or seats—can be easily replaced while the valve is *on the line.*

And even under high pressure, W-K-M Valves permit many repairs which can not be made to other valves without lengthy shutdowns.

Far-sighted design that protects you against such eventualities is an important part of TOTAL Valve Engineering—W-K-M's unique dedication to *all* phases of valve technology. It's one reason why W-K-M Valves are world-renowned for helping prevent production losses!

W-K-M

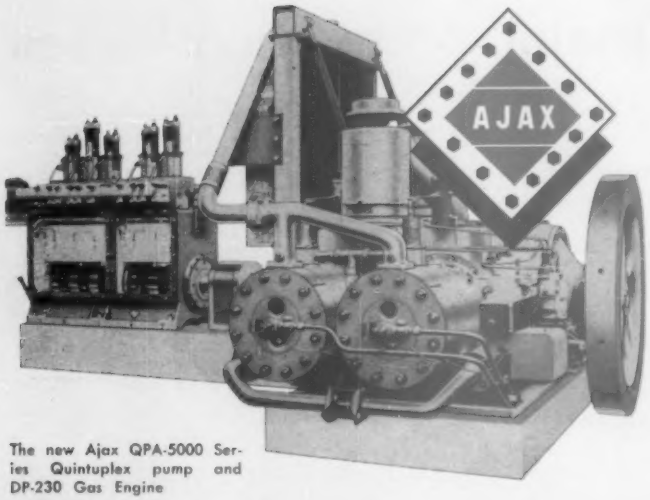
DIVISION OF ACF INDUSTRIES
INCORPORATED
P. O. BOX 2117, HOUSTON, TEXAS

6005

AJAX Gives You DEPENDABLE OPERATING AUTOMATION

With BUILT IN POWER SUPPLY

- Stark simplicity of operation and servicing — you don't need a specialist.
- Control engine speed to load and water requirements.
- Engineered to actual horsepower requirements without destructive overload capacity required by instantaneous starting demands



The new Ajax QPA-5000 Series Quintuplex pump and DP-230 Gas Engine

The need for dependable electrical power still remains one of the weak links in the usual automation installation — especially in remote locations and under certain climate conditions.

Ajax time proved engineering has now solved many of the automation-electrification problems. Automation today is economically sound if the equipment and the installation are designed to meet your particular problems. Contact your Ajax distributor today for the full story on automation without external electrification.

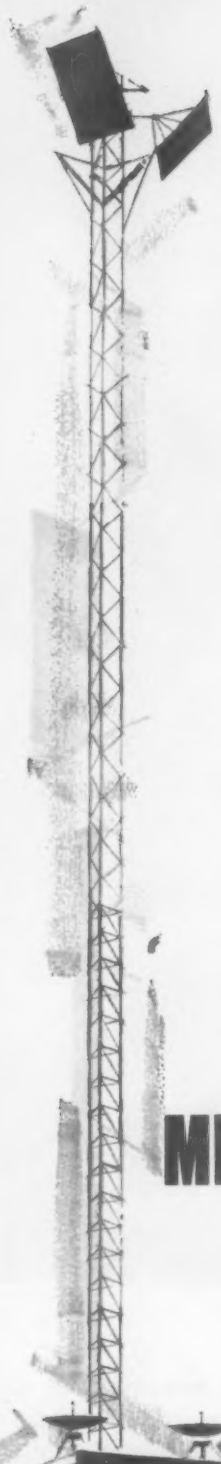
Ajax gives you true economy because of simplicity of design, ease of maintenance, extra long life, and 83 years of quality craftsmanship experience.

AJAX ENGINES AND PUMPS

AJAX IRON WORKS CORRY, PENNSYLVANIA

Oil Field Distributors

- The National Supply Co. — Pittsburgh, Pennsylvania
- Bethlehem Steel Co. — Supply Division, Tulsa, Oklahoma
- Mid-Continent Supply Co. — Fort Worth, Texas



COLUMBIA GAS SYSTEM
plans 470 miles of Collins microwave . . .

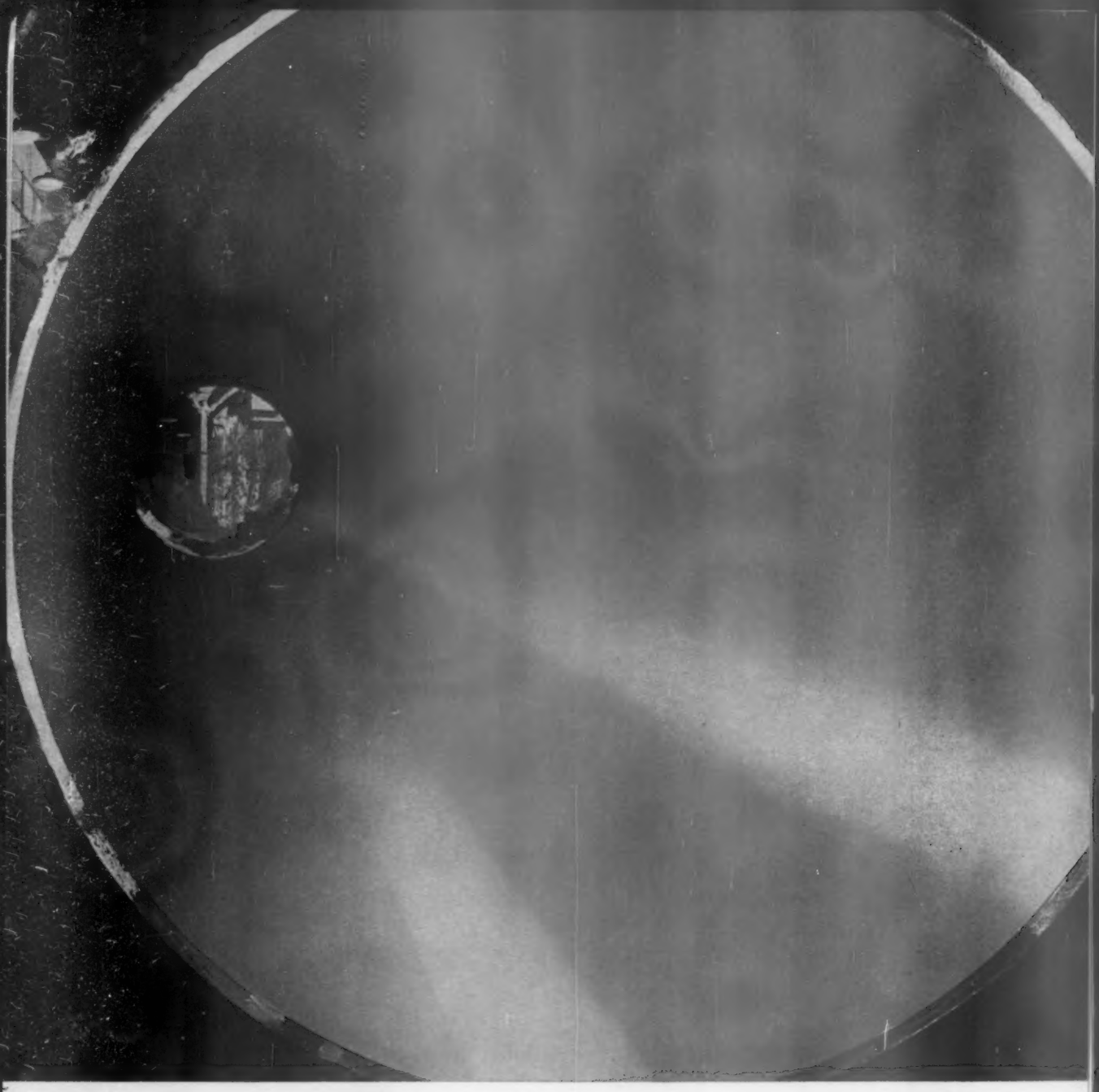
COLLINS MICROWAVE AND CARRIER

United Fuel Gas Company, a subsidiary of The Columbia Gas System, Inc., has ordered the first section of a Collins microwave system. When completed it will span four states and provide this major natural gas utility with complete facilities for voice communication, teletypewriter service, telemetering, supervisory control and data communication. Expandable to 240 channels, the Collins microwave system will be a part of a broad automation program being planned by Columbia.

For information on a microwave-carrier system tailored to your individual needs, contact Collins Radio Company, Texas Division Sales, 1930 Hi-Line Dr., Dallas 7, Texas.

COLLINS

COLLINS RADIO COMPANY • DALLAS, TEXAS • CEDAR RAPIDS, IOWA • BURBANK, CALIFORNIA

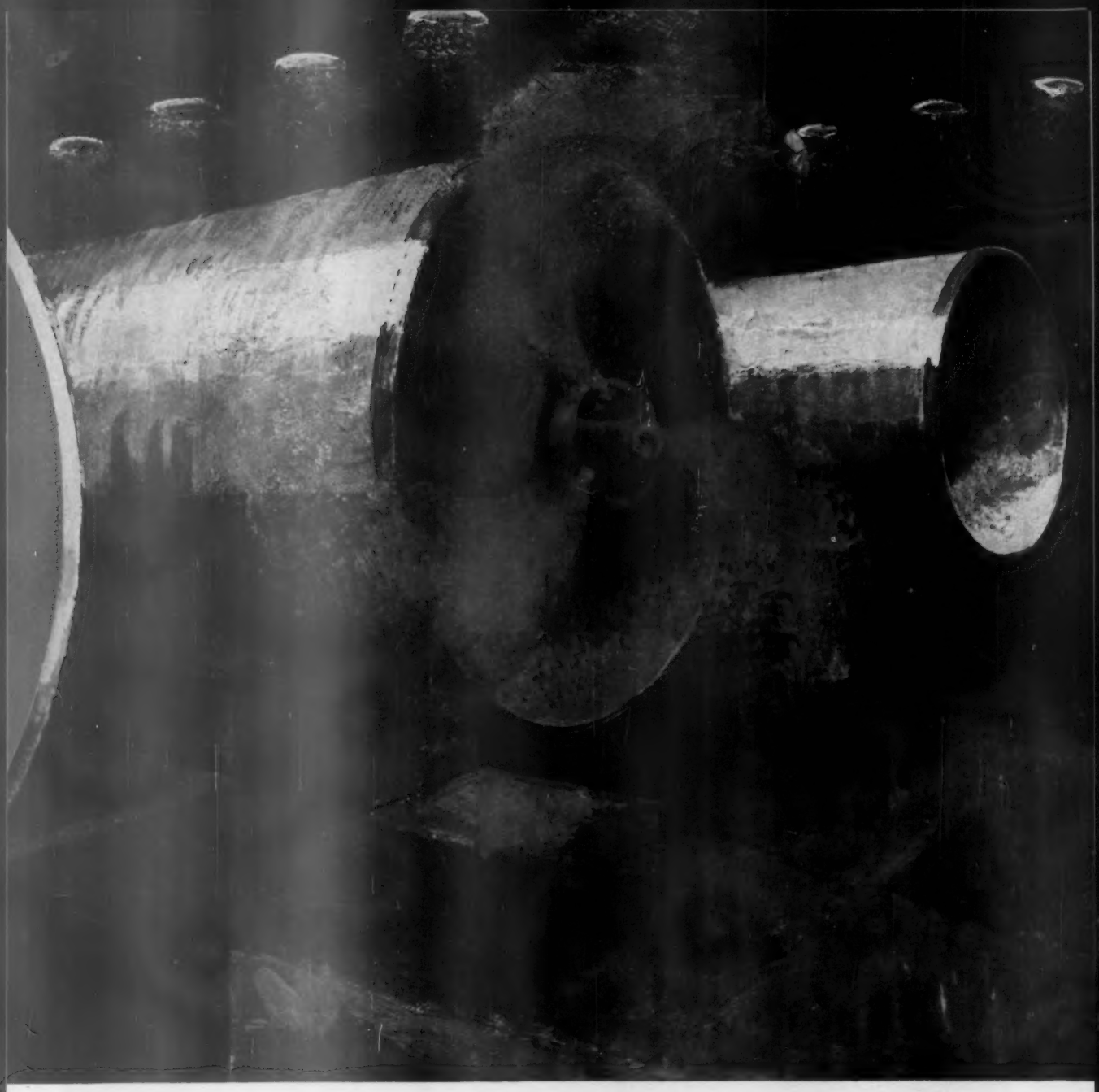


Now USS National Electric Weld line pipe can be internally coated right at the plant

National Tube has erected new buildings and equipment at the Orange, Texas, and McKeesport, Pennsylvania, plants. Your contractor can use these facilities to apply internal epoxy coating for increased flow efficiency and easier cleaning of line pipe.

The coating facilities are all *under roof* to elimi-

This mark tells you a product is made of modern, dependable Steel



nate weather hazards. No corrosion, water, or dust to complicate coating operations. You get a uniform, high quality internal coating job. We invite you and your coating contractor to visit our plants and see how these facilities can help you. Or write to National Tube, 525 William Penn Place, Pittsburgh 30, Pennsylvania.

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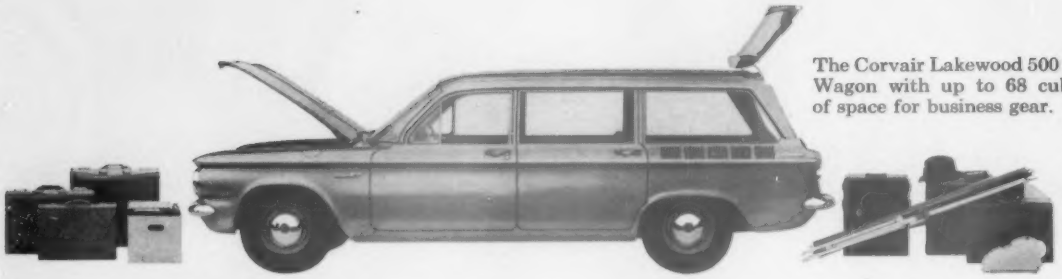


The Corvair Lakewood 500 Station Wagon with up to 68 cubic feet of space for business gear.

'61 CHEVY CORVAIRS & CORVAIR 95 TRUCKS READY FOR ANY KIND OF FLEET DUTY!

Now you've got a big family of Corvair cars and Corvair 95 trucks ready to go to work for you. And wait till you see how much they save in your fleet operation.

Three things they've all got in common: thoroughgoing thrift, real dig-in-and-go traction and driver-sparing handling ease. The thrift part you'll really go for. Every model, from Corvair coupe to Corvan truck, is priced to start you saving pronto. And, naturally, that air-cooled rear engine never needs costly antifreeze or radiator repairs. Mileage? Plenty of it, on gas and tires and brakes.

We could go on and on about Corvair's traction and handling ease. But we'll let your drivers do it for us, once they've been pulled out of a sticky spot by a Corvair, once they've wheeled a Corvair through knotty traffic.

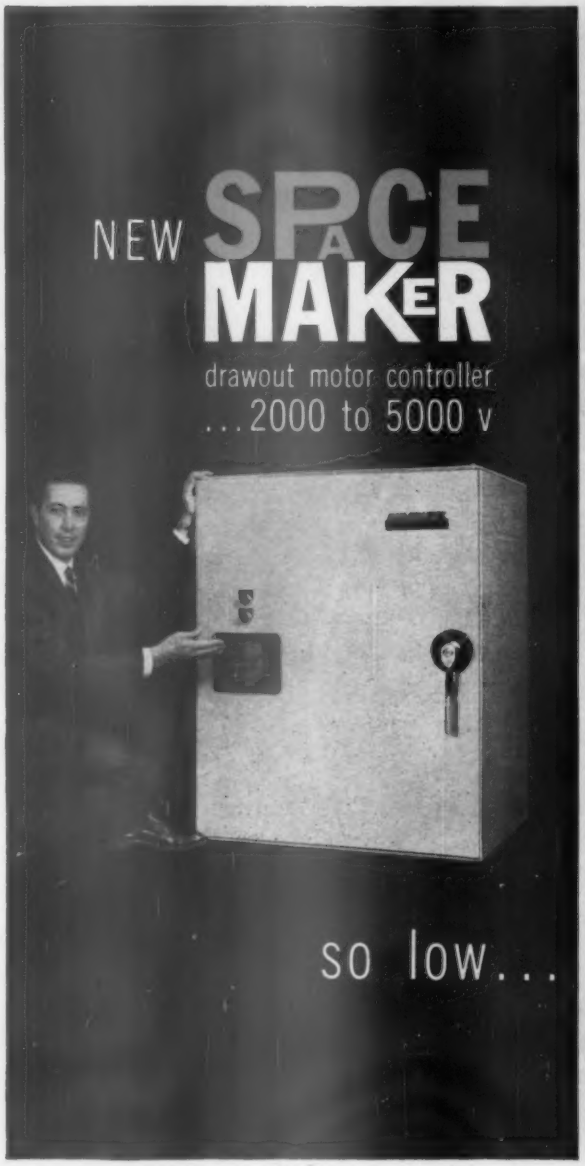
Your Chevrolet dealer's the man to see, whether you want a Corvair sedan for salesmen or Corvair 95 pickups for delivery duty. Or both. He'll be glad to talk Corvair's kind of thrift over with you in any case. Make that visit soon. . . . Chevrolet Division of General Motors, Detroit 2, Michigan.

Hardworking Corvair 95's: Rampside

Corvan

The Corvair 500 4-Door Sedan with nearly 12% more underhood cargo space this year.

ALLIS-CHALMERS

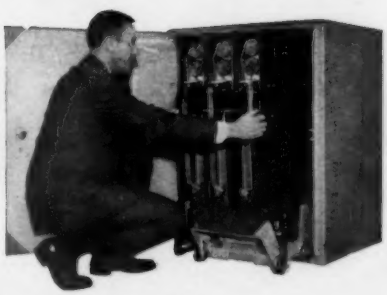


New *SpaceMaker* control is the first completely new high-voltage motor controller in more than a decade. It is the first two-high, 2 to 5 kv control center, and the first in its voltage class with complete drawout construction for unprecedented safety and accessibility.

Inspection and maintenance are greatly simplified. One man can easily roll the carriage from the control enclosure for complete accessibility. Arc chutes and barriers lift out and the pole pieces rotate to expose the contact structure.

And, SpaceMaker control is completely safe. It is impossible to come in contact with "live" parts because the contactor is connected and disconnected with the door closed and live line connections are isolated by automatic shutters.

For complete details of the new, years-ahead SpaceMaker *controller, call your nearby A-C representative. Or write* **Allis-Chalmers,** *Industrial Equipment Division, Milwaukee 1, Wisconsin.* A-1406



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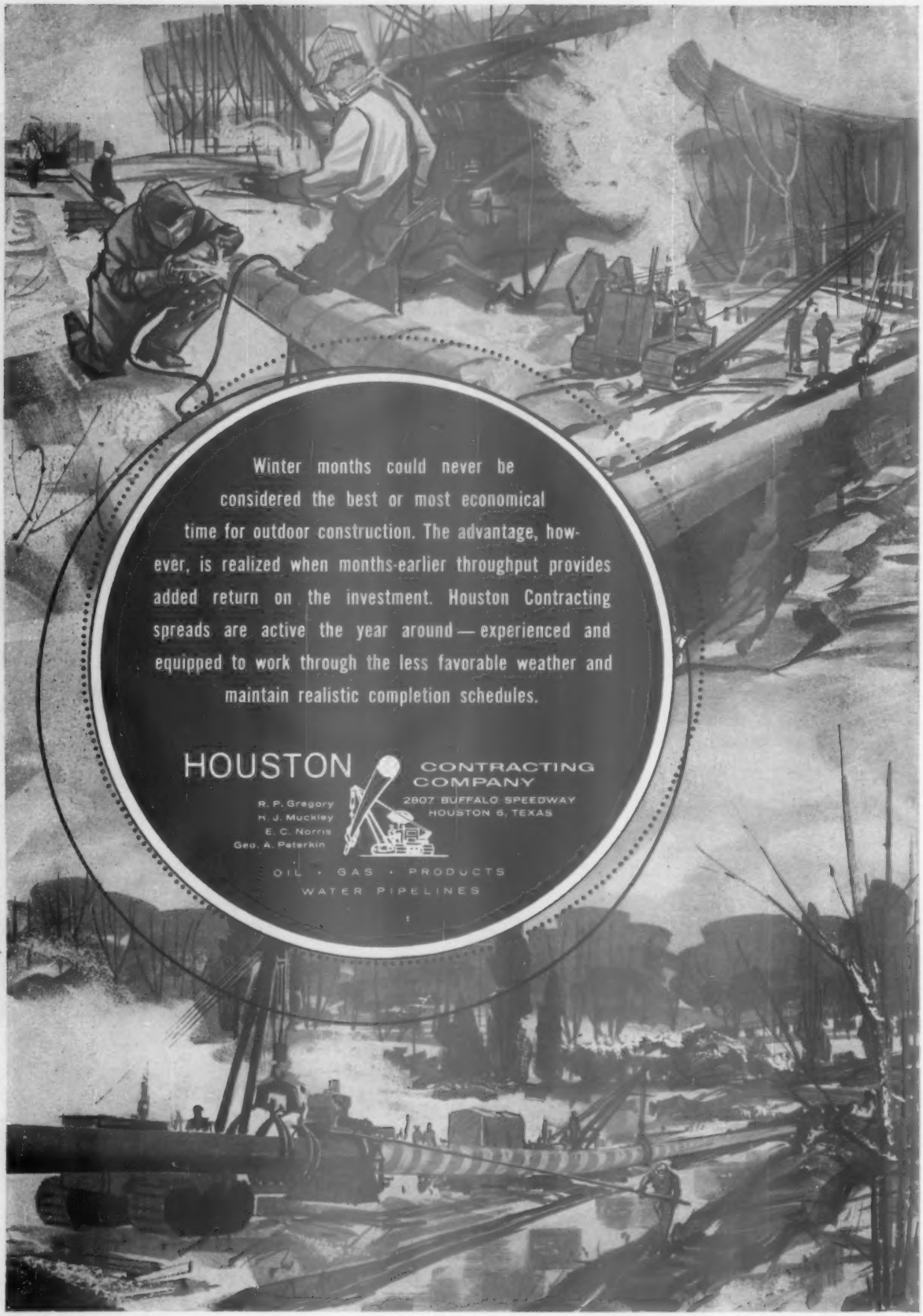
Winter months could never be considered the best or most economical time for outdoor construction. The advantage, however, is realized when months-earlier throughput provides added return on the investment. Houston Contracting spreads are active the year around — experienced and equipped to work through the less favorable weather and maintain realistic completion schedules.
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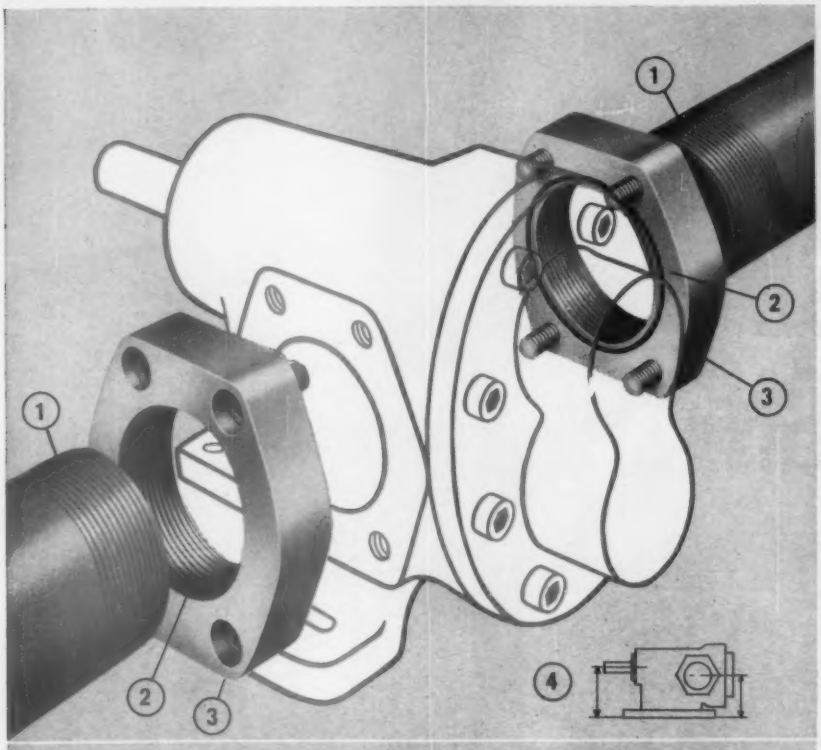
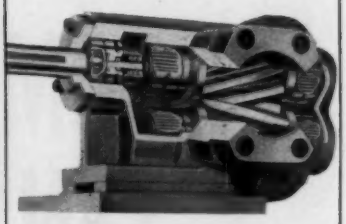


1 Standard threaded pipe connections fit 2", 3" or 4" pipe directly, without extra fittings. Plain pipe flanges optional.

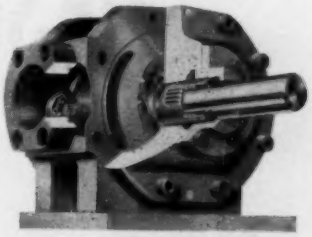
2 Inlet and outlet are same size.

3 Replaceable pipe flanges. Can be quickly changed to eliminate pump replacement caused by damaged threads.

4 Mounting dimensions help assure convenient replacement of other pumps.



New B&S "300" series rotary gear pumps. For pressures to 300 psi; caps. of 40, 60, 90, 125, 175 gpm.



New B&S "700" series gerotor pumps. For pressures to 1000 psi; caps. of 20, 30, 40, 60, 80 gpm. (Note: This highly-efficient design has unusually long service life, because contact between its inner and outer elements progresses at only 1/9 driven speed.)

a brand new line of rotary pumps with 4 big advantages for low-cost installation

You save on maintenance and get longer life, too

These new B&S rotary pumps are designed specifically for the Petroleum Industry.

They are constructed simply, with standard bolts and screws, for easy maintenance. They are equipped with roller bearings and replaceable wear plates, for extra-long service life. They save you money right down the line.

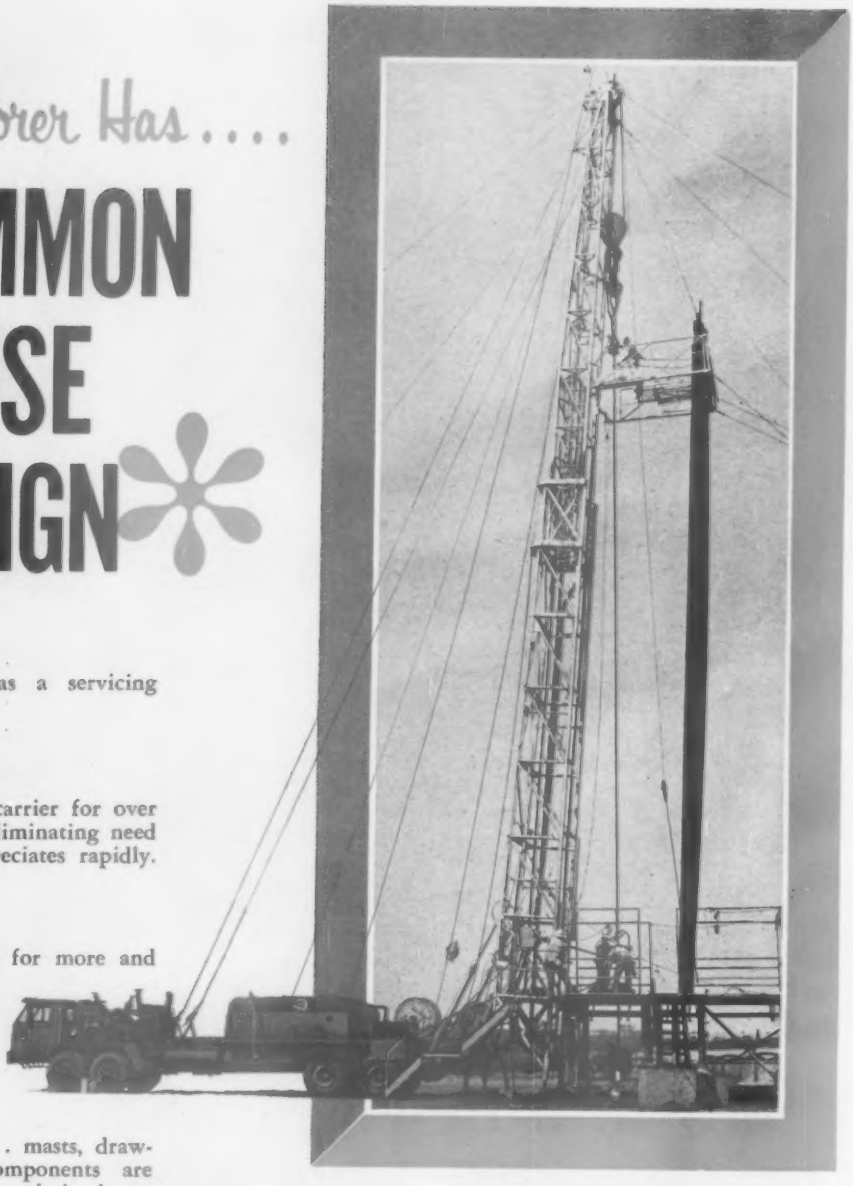
Rugged field tests have proven these pumps every bit as efficient and reliable as intended.

To start saving money on pumps, contact your oil field supply house about new Brown & Sharpe pumps. Ask them for a catalog, or write: Hydraulics Div., Brown & Sharpe Mfg. Co., Providence 1, Rhode Island.

Brown & Sharpe PRECISION CENTER

Franks Explorer Has....

COMMON SENSE DESIGN



CSD...

Primarily designed as a servicing and workover rig.

CSD...

Mounted on rugged carrier for over the road travel . . . eliminating need for truck which depreciates rapidly.

CSD...

Industrial horsepower for more and faster work.

CSD...

Greater flexibility . . . masts, drawworks and other components are interchangeable. Your unit is always up-to-date.

More Franks Explorers are sold than any other competing make — pretty good proof that the Franks Explorer **packs more punch!** Ask your Franks Representative for the facts.

WELL SERVICING AND DRILLING UNITS

FRANKS

PAMPA, TEXAS

CABOT

CABOT CORPORATION
MACHINERY DIVISION

Worth more when you BUY 'EM . . . Worth more when you TRADE 'EM

CHOICE OF EVERY MAJOR U.S. GAS DISTRIBUTION COMPANY

DEPENDABLE Assured by unique simplicity of design and construction. Only one moving part, a tough, resilient rubber tube that can never stick or wedge, serves as both diaphragm and valve.

QUIET There is no "slamming". The rubber tube silently rolls on and off the slotted metal body core. Actually, the quietest valve you can use.

VERSATILE Use for pressure reducing, remote control operations, back pressure control, automatic shut-off and manual open-shut flow control. May be self operated or used with electrical, pneumatic or hydraulic actuated pilots. Can handle gas, water, most petroleum products. Available in sizes 1" to 12", working pressures to 1500 psi.

write for technical data bulletins

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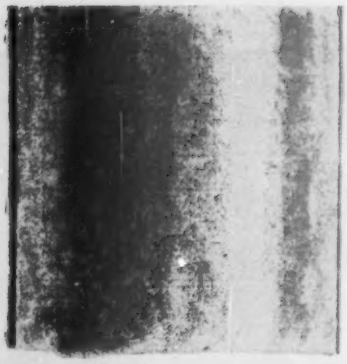
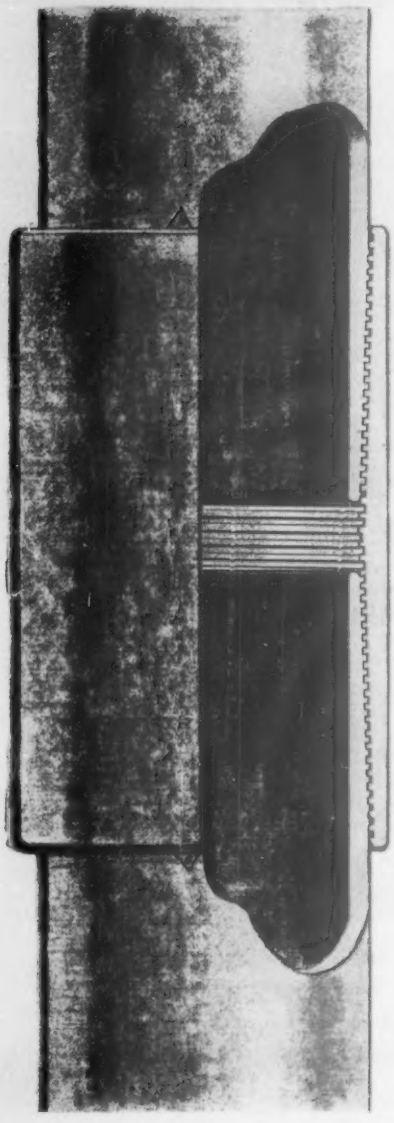


NEW!

For More Confidence In Casing Deep Wells

Pittsburgh Seamless Buttress Thread Casing



For safer, more economical completion of deep wells, you need casing with the best metallurgical qualities and strong joint design. You have it now from a new source in Pittsburgh Seamless Buttress Thread Casing.

Buttress Thread, a product of one of the country's pioneer seamless producers, will support the weight of longer casing strings. Here's why:

- Special open hearth furnace heats, made by skilled steel men with 55 years' experience, provide steel with the tremendous yield strength required.
- The small thread flank angle—three degrees—virtually eliminates hoop stress caused by tension.
- Coupling threads engage the casing threads throughout their entire length. The ¾-inch taper per foot is continuous. Fast angle vanishing threads are eliminated, so the full section of the casing supports string weight.
- Five threads per inch and the thread design promote easy stabbing and rapid spinning to reach a power-tight position.
- Inside clearance is the same throughout the string. There is no internal upset to reduce inside clearance.

For these reasons, Pittsburgh Steel Buttress Thread Casing is the best bet for your next deep well. For descriptive literature and more information, write:

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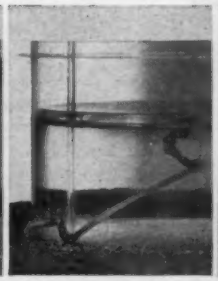
ON FLOATING ROOFS–

Chiksan Swivel Jointed Drain Lines team up strength + flexibility + endurance

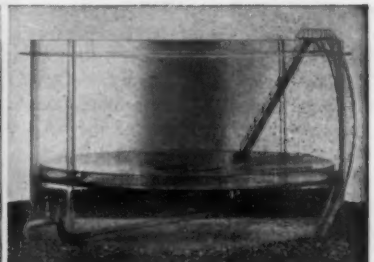
The unlimited flexibility of Chiksan swivel joint equipped floating roof drains mean money saved on every tank. First, Chiksan drains cost less than rubber hose —and, you count their useful life in years instead of months. Chiksan swivel joints and lines easily withstand tank pressures —never kink to cause drain stoppage. Both lines and joints are available in many types of metals to meet specific liquid storage requirements.

Plan now to include Chiksan drain lines in all new tank installations and in present lines that need replacement. For details, contact Chiksan or your nearby Chiksan field representative.

FULL TANK. Drain line flexes readily. Easily withstands tank pressures.



TWO THIRDS FULL. All metal line moves freely with the floating roof without danger of kinking.



TWO THIRDS EMPTY. Line folds compactly. Provides long years of trouble-free service.

CHIKSAN fmc

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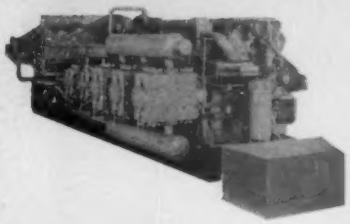

Design engineered for gas booster service in the Louisiana Gulf Coast area, this packaged GMXF-10 compressor moves 4.43 MMSCFD. It is rated at 825 bhp. Equipped with Entronic Controls for remote field operation, this unit is a typical example of the efficiency gained by specifying C-B/Southern Packaged Compressor Plants.

CB/S

PACKAGED COMPRESSORS

Designed Engineering For . . .

CB/S Packaged Compressors Starts With the Customer's Problem

Sound gas compression engineering starts with understanding the basic problem. C-B/Southern sales engineers are registered petroleum engineers with actual producing experience. They assess the customer's problem, whether it is gas gathering, gas lift or gas injection, to make positive, workable suggestions. From quotation to field installation, engineering knowledge is based on practical experience. For example, last year, C-B/S built more horsepower than any other two compressor packagers combined. And because the company offers the widest range of horsepower size, C-B/S engineers have the right component to meet every specification the customer wants.

As an added benefit, C-B/Southern Packaged Compressor Plants are never orphans. Backed up by engineers in 22 Cooper-Bessemer sales and service offices, C-B/Southern service operates on a 24-hour schedule, everywhere.

C-B/S Packaged Compressor Plants are available in horsepower ratings from 100 to 1100; unitized compressors, both reciprocating and centrifugal, to 10,500 horsepower.

CB/S

C-B SOUTHERN **P. O. BOX 19267**
HOUSTON 24, TEXAS **HOmestead 8-5441**
Manufacturers of packaged compressor plants for gas gathering, gas lift, gas injection applications

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They Say—

Eight-hour drilling record

Dear Sir:

Just finished reading your fine magazine and thought I'd pass along something concerning "Just for the Record" in the January 30 issue (Among the Drilling Contractors, p. 217).

Mene Grande Oil Co. in El Tigre, Venezuela, released a story in late 1959 regarding their GE equipped rig and the depth drilled in an 8-hour tour. Their rig No. 31 crew drilled a 9⅝-in. hole a total of 3,459-ft. which, at that time, was considered a world's record for an 8-hour tour.

The rig also drilled 39 wells a total depth of 204,100 ft. in only 10 months of operation.

C. D. Neithamer
Locomotive and Car
Equipment Department
General Electric Co.

Synopsis article revived

Dear Sir:

You are to be congratulated on your coverage of the Lisbon, Utah, field (OGJ, Jan. 23, p. 134). This type of synopsis is not only ideal but necessary for the profession. Even in these "slack" times it is nearly impossible to keep up with developments.

C. C. Reeves, Jr.
Instructor of Geology
Texas Technological College
Lubbock, Tex.

This feature, used by the Journal for many years, is now being revived. It will appear at 2 to 3-week intervals.—Ed.

End-of-year drilling figures

Dear Sir:

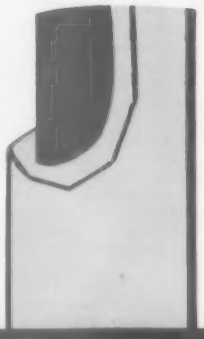
On page 118 of your January 30, 1961, Review and Forecast issue, you show a tabulation of rotary and cable-tool wells.

Since our work is done mainly in rotary-drilled wells, this tabulation is most interesting to us; it should be of equal interest to many of your other readers. Actually, the rotary drilling market is so impor-

GRIGSBY Brothers, Inc.
specialized INDUSTRIAL COATINGS

Blast Joint Protector for Tubing Strings

A patented plastic exterior coating developed for use in multiple gas and oil wells located in those areas where tubing strings are subjected to erosive blast from casing perforations. Permanently affixed to the outer walls of the tubing string, in standard thicknesses of ⅛" and ¼", the Blast Joint Protector is guaranteed against shifting, sliding, buckling or bellying under pressure, or splitting under temperatures up to 285° F.



Outlasts other ¼" coatings 10 to 20 times. Pressure-tested to 12,000 psi. Operating range to 285° F. Impervious to normal acids and alkalies.

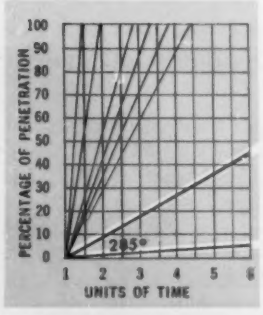
MAXIMUM PROTECTION

Takes 20 times longer to blast through than steel piping, 10 times longer than stainless. No handling problems. Impact resistant, and sufficiently flexible to take normal pipe deflections. ¼" coating adds only 1 lb./ft. to over-all weight of pipe.

800% LONGER TUBING STRING LIFE

Extends time between costly well reworkings. Insures maximum production flows from various sand levels. Prevents leakage and mix-flow problems.

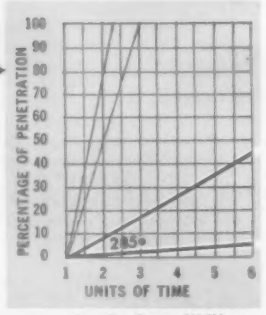
IMPROVED WELL PRODUCTION



◀ vs other shieldings

vs steel and stainless pipe ▶

Graphs show results of tests under rigidly controlled simulated field conditions. Full test reports available. Write for your copy.



GRIGSBY BROS., INC.

P. O. Box "X"
Lafayette, La.

tant to us that we also keep what we consider to be reliable U. S. figures on it.

The tabulation below shows a comparison of our final 1960 data with yours. We have also included for further comparison an AAODC tabulation of monthly average rotary rigs making hole.

	1959	1960	% change
Our rotary completions	41,950	35,440	−15.6
OGJ rotary completions	42,494	34,751	−18.
AAODC rotary rigs	2,074	1,745	−16.
OGJ cable-tool completions	9,270	12,000	+29.4

The above comparisons on rotary wells vary by less than 2%. As a consequence, we must believe that the final totals, and the decreased market in 1960, are reliable.

Now, may we call your attention to your final tabulation entitled (November) "Well tally in the United States" on page 223 of your December 26, 1960, issue. At that time you were carrying cable-tool completions at 20% of total completions. At year's end, you corrected cable tools to almost 26% of total completions.

This means that you shifted over 2,500 wells from the rotary column to the cable-tool column.

To you this may seem academic. It is not so to us because it represents a drastic change in the magnitude of the rotary drilling market in 1960. Your end-of-November figure indicated a 10% drop from 1959, your year-end figure a drop of 18%.

Let us consider your cable-tool figures. In exploring your past statistics, it is necessary to go back to 1948 to find a year where more than 25% of the wells completed were cable-tool completions. During the past decade the per cent of cable tools varied from 13% to 18%. In 1959, it was 18%. The largest number of cable-tool completions in recent years—9,484—was drilled in 1956.

From AAODC statistics we note that an annual average of 2,142 cable-tool rigs were required to complete the 9,484 wells in 1956. In 1960, AAODC says the annual average was only 1,942. Yet, you say 12,000 cable-tool wells were drilled.

In light of these statistics we ques-

tion whether a record 12,000 such wells were drilled in a relatively poor drilling year.

It is not our intent to be critical of your end-of-year statistics. We are cognizant of the time and effort you put into your data. However, the fact remains that the industry depends on you to supply these figures and to assemble them in the most usable manner.

Toward this end, would it not be possible to make an earlier than year-end breakdown of rotary vs. cable-tool wells which does not require drastic revision at year's end?

Finally, noting that rotary wells were reduced by 18% from 1959 makes 1960 a much poorer drilling year than your general market analysis would indicate. We are one company that believes this to be the case, and I am sure every rotary drilling contractor in the United States agrees with us, to say nothing of other service, supply, and manufacturing companies.

R. R. Rieke
General Sales Manager
Schlumberger Well Surveying Corp.
Houston

Many figures on cable-tool drilling are not available to us until near the end of the year. This year we underestimated the percentage of total wells drilled by cable tools and when the year's tally came in, a correction was in order. We have firm data to support our total well figures. Only the breakdown is estimated for some areas. Numerous double checks indicate that our breakdown of cable-tool and rotary completions is a reasonable estimate. Furthermore, we are now getting current figures on important areas by type of rig, which will obviate most year-end corrections.—Ed.

Letters to They Say should be addressed to The Editor, The Oil and Gas Journal, Box 1260, Tulsa, Okla.

CALENDAR

FEBRUARY

14 Petroleum Equipment Suppliers Association, eastern district meeting, Duquesne Club, Pittsburgh.

14-15 National Association of Corrosion Engineers, Shreveport, La., section, short course, Centenary College, Shreveport.

15-16 Western Petroleum Refiners Association, Gulf Coast regional technical-industrial relations meeting, Rice Hotel, Houston.

16 API Committee on Public Affairs, Dallas regional conference on employe communications, Sheraton-Dallas Hotel, Dallas.

18 Purdue University, business history conference, "Management Decisions Under Government Regulation," Memorial Union, Purdue University, Lafayette, Ind.

20-Mar. 11 Advanced Drilling Practices Course for Engineers, University of Oklahoma, Norman.

23-24 Oklahoma State University, natural gas conference, Stillwater, Okla.

23-24 Chemical Institute of Canada, conference of the protective coatings division: Toronto, Feb. 23; Montreal, Feb. 24.

23-25 Canadian Pipe Line Contractors Association, meeting, Empress Hotel, Victoria, B.C.

24 Natural Gasoline Association of America, South Louisiana regional meeting, Lafayette Petroleum Club, Lafayette, La.

26-Mar. 1 American Institute of Chemical Engineers, petrochemical and refining exposition, Municipal Auditorium, New Orleans, and national meeting, Hotel Roosevelt, New Orleans.

26-Mar. 2 American Institute of Mining, Metallurgical, and Petroleum Engineers, annual meeting, Chase and Park Plaza Hotels, St. Louis.

27 Canadian Society of Exploration Geophysicists, conference on exploration geophysics—today and tomorrow, Pallister Hotel, Calgary.

28-Mar. 1 API Committee on Public Affairs, New York regional conference on employe communications, Park-Sheraton Hotel, New York City.

MARCH

2 Petroleum Equipment Suppliers Association, north Mid-Continent district meeting, Mayo Hotel, Tulsa.

3 Ohio Oil and Gas Association, winter meeting, Deshler Hilton Hotel, Columbus.

3 Southern Gas Assoication, transmission section, annual spring management conference, Sheraton-Dallas Hotel, Dallas.

5-9 American Society of Mechanical Engineers, gas-turbine power division, and U. S. Department of Defense, annual gas-turbine conference and products show, Shoreham Hotel, Washington.

7 Petroleum Equipment Suppliers Association, Pacific district meeting, Ambassador Hotel, Los Angeles.

7-8 University of Oklahoma, School of Geological Engineering, seventh biennial geological symposium, Student Union Building, University of Oklahoma, Norman.

8-9 API Committee on Public Affairs, Chicago regional conference on employe communications, Sheraton-Towers Hotel, Chicago.

8-10 American Petroleum Institute, Division of Production, southern district meeting, Captain Shreve and Washington-Youree hotels, Shreveport, La.

13-16 Kentucky Petroleum Marketers Association, sixth management institute, conducted by the University of Louisville, Brown Hotel, Louisville.

13-17 National Association of Corrosion Engineers, annual meeting and corrosion show, Hotel Statler, Buffalo, N. Y.

15-17 Natural Gasoline Association of America, annual convention, Baker Hotel, Dallas.

16-17 International Oil and Gas Educational Center, study of the economics of petroleum exploration, development, and property valuation, Southwestern Legal Center, Dallas.

20 American Gas Association, general management section conference, Francis Marion Hotel. Charleston, S. C.

21-23 American Power Conference, twenty-third meeting, Sherman Hotel, Chicago.

21-30 American Chemical Society, 139th annual meeting, Kiel Auditorium, St. Louis.

22 American Institute of Chemical Engineers, Chicago section, symposium on new developments for chemical processing and new developments for the engineer and management, Conrad Hilton Hotel, Chicago.

22-24 American Petroleum Institute, Division of Production, southwestern district meeting, Cole Hotel, Albuquerque.

23 National Industrial Conference Board, general session, Shamrock-Hilton Hotel, Houston.

23-24 North Texas Oil and Gas Association, annual meeting, Kemp Hotel, Wichita Falls, Tex.

27-28 University of Wichita, School of Engineering, third annual production institute, university campus, Wichita.

27-29 Midwest Gas Association, annual meeting and convention, Sheraton-Fontenelle Hotel, Omaha.

27-31 Instrument Society of America, symposium on temperature measurement and control in science and industry, Veterans Memorial Auditorium, Columbus, Ohio.

28-29 University of Oklahoma, Schools of Petroleum and Gas Engineering, gas conditioning short course, Oklahoma Memorial Union Building, University of Oklahoma, Norman.

APRIL

4 Instrument Society of America, New Jersey section, annual symposium on electronic process instrumentation, Hotel Essex House, Newark, N. J.

4-5 University of Kansas, gas compressor institute, Liberal, Kans.

5-6 Third annual symposium on pilot plant and process automation, Ambassador Hotel, Los Angeles.

5-7 American Petroleum Institute, Division of Production, Mid-Continent district meeting, Mayo Hotel, Tulsa.

6-7 University of Oklahoma, School of Mechanical Engineering, short course on industrial engines, University of Oklahoma, Norman.

6-8 Texas Oil Jobbers Association, Petroleum Marketers Association, convention and trade show, Baker Hotel, Dallas.

7-9 American Institute of Mining, Metallurgical, and Petroleum Engineers, Southwestern Alaska Chapter, sixth annual mining, minerals, and petroleum conference, Anchorage, Alaska.

8-12 Petroleum Equipment Suppliers Association, annual meeting, The Greenbrier, White Sulphur Springs, W. Va.

10-11 American Society of Mechanical Engineers, maintenance and plant engineering conference, Bancroft Hotel, Worcester, Mass.

10-12 Western Petroleum Refiners Association, annual meeting, Granada Hotel, San Antonio, Tex.

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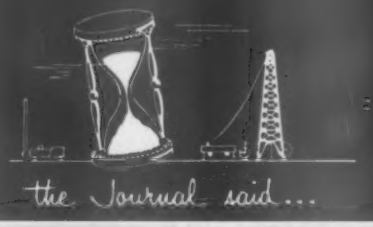

50 years ago

February 16, 1911

Major pipeline companies are coming to the aid of oil operators in the Osage reservation and Cherokee districts of northern Oklahoma who have been hard-pressed by the acute water shortage brought on by the prolonged drought. They are connecting water lines in these areas and will pipe water from the Verdigris River to supply pumping and drilling needs free of charge.

Contracts have been let for drilling six oil wells at Katalla, in Cooper River Valley, on the south coast of Alaska. Two each will be drilled for Amalgamated Oil Co., Clark Davis, and Camp 7.

California's largest gas well, drilled by Honolulu Consolidated in the Buena Vista Hills area, blows out and catches fire with a flow of more than 50 M.M.c.f.d. Steam from eight 60-hp. boilers fails to extinguish the flames, flaring more than 200 ft. high.

25 years ago

February 13, 1936

Union Oil Co. of California runs and cements world's longest string of casing in its 1 Lillis-Welsh deep test in North Kettleman Dome field, California. The 10,815-ft. string of 6⅝-in. pipe exceeds by 514 ft. the length of the previous record string of 10,301 ft. of 7⅝-in. pipe in Gulf Production Co.'s 103 McElroy, in Upton County, Texas.

Phillips Petroleum Co. and Shell Petroleum Corp. find gusher oil production in Wilcox sand in a deep test on old Billings structure, in Noble County, Oklahoma. Their 1 McCaughtry flows 200 to 300 bbl. of oil per hour at 4,231-58 ft. to become state's first important oil strike of year. Deep discovery in old shallow-sand area precipitates new active drilling.

10 years ago

February 15, 1951

Celanese Corp. of America forms Canadian subsidiary, Canadian Chemical Co., Ltd., to build western Canada's first major petrochemical plant. Proposed Edmonton plant to utilize rich newly developed natural-gas reserves in the prairie provinces.

Continental Oil Co. and Union Oil Co. of California conclude exchange agreement transferring to Continental the interests of Union in formerly jointly owned properties in Circle Ridge, Maverick Springs, Lance Creek, Lake Creek, and North and South Sunshine fields in Wyoming, Douglas Creek and Thornburg fields in Colorado, and East Moss Lake field in South Louisiana. Continental turns to Union a portion of its total interest in Kettleman Hills field, and Huffman and Western States gasoline plants, in California.

JOURNALLY SPEAKING

Pennies from Harvard

THEY'RE matching pennies at Harvard to determine the proper price for natural gas in the Southwest.

That's a fact. It shows the extremes into which Federal Power Commission hearings ramify in trying to determine the "cost of service rate base" for independent gas producers.

It came about in this way: One factor in fixing prices on a utility formula is the rate of return. Gas producers say they need a higher rate of return on their investment than a genuine utility does because of the great risk in exploration.

Eastern gas distributors say this is nonsense. They admit there is some risk in wildcatting, but they say that it is no greater than in any other kind of business because the industry operates on a known probability factor which permits the risk to be discounted.

A leading proponent of this idea is Dr. Jules Joskow, a professor of mathematical theory and statistical measurement, who has been a witness for consumer interests in several FPC cases.

Dr. Joskow started with one fact — an intriguing, inexplicable, but nevertheless undisputed fact. That is a report of the American Association of Petroleum Geologists which shows that in every year since 1944, no matter how many wells were drilled, the success ratio of new-field wildcats was almost exactly 11%, with only minor fluctuations.

This proves, to Dr. Joskow's satisfaction, that one out of nine wildcats is bound to hit. On the strength of this he constructed a table showing that if a company drills 20 wildcats a year it has a 5% chance of a 90% success ratio, a 10% chance of a 66% ratio, etc., and the more wells it drills the less risk it incurs.

To bolster his conclusions, the professor testifies learnedly about the classical probability theory, the binomial expansion, the Poisson distribution, the Tchebycheff inequality, and the Bayes theorem.

And when petroleum engineers, testifying for producers, admit under crossexamination that they don't know much about these things and don't use them in recommending a drilling program, the opposing lawyers try to leave the impression that they aren't very competent oil men.

So then a Harvard professor got interested. He put eight pennies of the same date (dry holes) and one penny of a different date (successful wildcat) in a box and drew them out at random. He concluded that while several million draws might conform to Dr. Joskow's probability table, the chances are pretty slim that every individual wildcatter will get one strike out of nine tries.

To test the matter further he has now built an automatic penny-tossing machine—no kidding—and is having his students keep records on hundreds of "wildcatting" programs. When this noble experiment is completed maybe FPC can determine how much return a producer needs on his investment.

There ought to be an easier way than this.

As a matter of fact, there is—if the industry can only dig up the needed statistics.

What's needed first is how many of what AAPG calls successful new-field wildcats produced enough to pay for themselves, let alone the other eight that were dry.

Then we need authentic records of operators who drilled long strings of dry holes. We've all heard tales of "Dry-Hole Doakes" who drilled a hundred and umpteen dusters in a row, but what's needed is an industry-wide, verified compilation that will be admitted as evidence in an FPC hearing.

Possibly — just possibly — FPC might give the facts of the oil business more weight than the theory of binomial expansion.

—Henry D. Ralph

MOST RESPECTED PACKER

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PRODUCTION PACKER
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THE DOUBTS that harass well operators got a real body blow when the now-celebrated Baker Retainer Production Packer was developed some years ago.

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THAT'S A TOUGH proving ground—one that has helped us soak up a vast knowledge of what happens to slips, packing elements, and the like, when a packer is downhole. We've got the facts.

Baker made the first retainer packer—for many years the *only* retainer-type packer. The result is a wealth of packer experience that's hard to equal.

This remarkable packer shows it. Over the years we've refined it into a tool that has unyielding stamina. That's why we can call it the most predictable packer of them all.

This great packer has many applications—it's as versatile as it is dependable. It's a single-string production packer that comes in many sizes and bores. Moreover, it is surrounded by a family of accessories that transform it into a dual or triple packer—or into a temporary or permanent bridge plug or squeeze tool. Its formidable pressure-holding capacity makes it in many ways one of the finest of all squeeze packers.

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BAKER

Here's a practical new approach to Washington

THE NEW Kennedy administration is now shaping up to the point where the oil industry can take its measure and revise its own policies and approaches accordingly.

The term "revise" is used advisedly. There's a brand-new atmosphere in Washington, and this calls for revision of industry attitude.

The New Deal administration was considered antibusiness, so oil dug into a defensive position. The Eisenhower administration was considered probusiness, so oil drifted with a laissez faire policy.

WHAT WE HAVE NOW is quite different. The young men around Kennedy are eager for action and change, movement and improvement, new goals and new methods. And they are determined to get them.

Yet for all their restlessness they are not visionary theorists with preconceived blueprints. They appear to be practical and realistic, inviting suggestions, feeling their way. But they demand new ideas and, above all, activity.

As to oil and gas matters, most of them profess lack of knowledge but open and inquiring minds. They want education, but they won't swallow it in the form of doctrinaire dogma.

So now is the time for oil to make itself known around Washington, while the new officialdom is in a listening mood and before policies get crystallized. Make itself known, liked, and helpful.

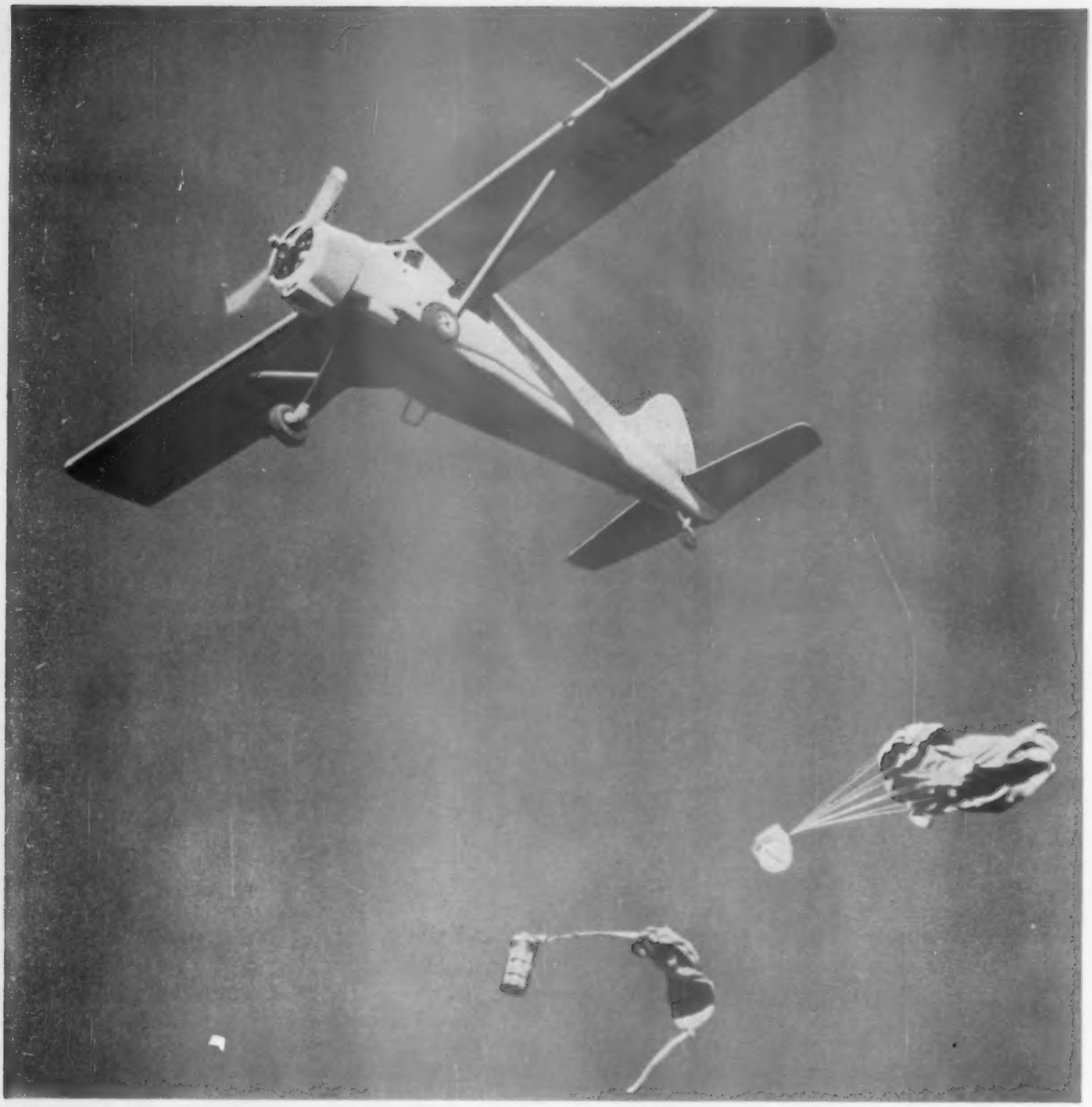
In doing this the petroleum industry is handicapped by its traditional lack of a spokesman or even a central clearing house in Washington. It is doubly unfortunate that the various industry segments cannot bury their animosities and suspicions so as to speak with a single voice on at least some things, because it appears that the administration is disposed to view the industry as a single entity.

So a fractionated industry must do the best it can to present petroleum's problems in a fair and factual way. It must do more. It must actively seek out opportunities to participate in formulating policies and in helping to apply them from the public-interest standpoint.

AN INEVITABLE TREND is toward more public interest in and public direction of industries as strategic as oil and gas. This need not bring federal regulation in the technical sense—provided Washington is persuaded that specific regulation is not needed.

There is a current feeling that the oil industry is not sufficiently progressive and public minded. This will be corrected if oil men will meet the new administrators halfway, offer a friendly hand, and advance some constructive proposals for reaching the administration's objectives.

In short, if oil can effect a bright-eyed, crew-cut appearance to match that of the administration it may get a good reception and good treatment in Washington. But it has to understand the temperament of the architects of the New Frontier.



Airlift Australia

AUSTRALIA'S Snowy Mountains Scheme has presented some unusual challenges to BP as sole supplier of petroleum products. Some of these challenges have been met in unusual ways, such as fuel drops from aircraft.

This gigantic project, midway between Sydney and Melbourne, with its great dams, power stations, and miles of tunnels and aqueducts, is designed both to provide hydro-electricity and to divert irrigation water westwards into the parched plains.

British Petroleum is proud to be associated with the Snowy Mountains Scheme, one of the world's greatest engineering undertakings.

BP

Oil Has Few Friends in High Places

• As Kennedy picks his policy-makers, the industry braces for changes that are bound to come. The chief danger: Most of the new officials know little about oil. It's going to be up to the industry itself to establish rapport.

Clyde La Motte
Washington Editor

IT IS SIZING-UP time in Washington.

New men are getting squared away in top policy-making governmental positions.

New ideas are being broached, new plans being drafted.

It is essential that oil, an industry increasingly subject to governmental control, size up these men and their ideas so it won't be surprised by and unprepared for the changes that lie ahead.

For this much is certain: These new government officials are in Washington to make changes. Whether they succeed or not, they will chalk up a vigorous try.

This is not unusual, of course. When any new administration takes over, its people generally head for the Capitol with determination to set things right.

But there can be a difference in their mood, their purpose.

Remember when the Eisenhower team came on the scene? Its aim was to "clean up that mess in Washington" and to apply the clear logic of the successful business man and industrialist to the problems of government.

In general, the goal was a sound, solid government—one that would try to give private enterprise a chance before moving in.

Now the men are different. Their approach and their purpose are different.

Their aim, largely, is an active government—one ready and willing to move quickly in whatever direction they deem is needed "to get this nation going forward again."

The Kennedy stamp . . . As the new administration officials take office, one can discern in most of them a distinct Kennedy stamp which identifies them as members of the Kennedy team.

These are the traits most of them appear to have in common: They are young, eager, aggressive. And although many are Phi Beta Kappas, these are not visionary dreamers filled with pet theories or grandiose schemes.

Rather, these men are obviously "doers." Unlike some of the "egghead" types of the past, most of these men are experienced in the hard school of politics. They are sharp, practical realists, not naive and sensitive scholars.

There is a sense of urgency about them, and a tough fibered determination to do a job.

The Kennedy approach . . . Note that most of the Kennedy officials are moving into their jobs with a minimum of talk about specific plans and programs.

They do not intend to make situations fit predetermined blueprints

Two Top Makers of Oil Policy

Interior Secretary Udall . . .

. . . has no oil background, but he has chosen some advisers who have—and it's obvious he realizes the importance of the industry.

Treasury Secretary Dillon . . .

. . . has taken no definite position on such key topics as percentage depletion but he is known to favor liberalization of depreciation.

but will use the approach of drawing blueprints to fit situations.

Therefore, for the most part, they are sizing up the lay of the land carefully. Weighing tactics and strategy, they are getting their targets clearly in sight before squeezing the administration trigger.

Part of this stems from an awareness that they still have to sell Congress and the public on any programs they undertake. They realize keenly that they have been given no blank check for action by the voters. They know they will have to fight every inch of the way.

The closeness of the presidential election was evidence of that. And if further proof were needed, it was supplied in the touch-and-go battle over the House Rules Committee.

So, eager as they are for action, these new men are going to feel their way. For that reason, you will frequently see trial balloons being loosed to test the public's reaction to an approach.

However, once they are committed to a course of action, they will be impatient to press ahead. And they will use all the political skills at their disposal to put their programs across.

1. Where oil fits in

There are few friends of oil in the Kennedy circles, and few who have much experience with the oil industry and oil problems.

This is a definite drawback. However, there has been little indication that the industry will be singled out as a target as, say, the bankers were in the early days of Franklin D. Roosevelt's regime.

A common characteristic of most new officials who will have to deal with oil is that they are approaching their jobs with open minds. They are inviting ideas.

True, some display signs of being crusaders bent on shaping oil's future to a mold of their designing. But these are the exceptions.

The greatest apparent danger to the oil industry lies in two other areas:

. . . Lack of information on oil and lack of understanding by key officials.

. . . Lack of participation in governmental affairs by oil officials.

If the industry, wary of the Kennedy approach, tends to draw into a shell, Washington officials will get their information (or misinformation) on oil from other sources.

Frank B. Ellis . . .

. . . heads the Office of Civil and Defense Mobilization, which deals with oil-import controls.

Henry H. Fowler . . .

. . . chief aide to Treasury's Dillon, will play a major role in tax policy-making.

And if the industry does not make suggestions and offer advice, the Kennedy team will turn elsewhere for a proposed program of action affecting oil.

This does not mean, of course, that the industry must agree with and support Kennedy policies affecting oil. But in the current Washington atmosphere it seems likely that success will go to those who, when opposing some course of action, suggest a practical alternative.

Clues to future . . . Because the new officials in the Kennedy administration have not been in office long enough to make their course clear, the best clues for what may happen lie in their past actions and in their public utterances.

Generally speaking, the tone does not augur well for the oil industry.

Considerable emphasis is being given by the administration to planning for various segments of business and industry, including oil.

There is also the strong impression that Kennedy forces feel that somehow business and industry aren't getting things done fast enough on a big enough scale. This poses the likelihood that government will step in more and more.

There is more than a hint that some Kennedy officials feel the federal regulatory agencies have been favoring industry and business and short-changing the general public.

And, for political purposes or otherwise, there is going to be much stress put on pricing investigations and other practices, thereby giving Kennedy men a chance to show that they are protecting the "little" man.

Any changes in the near future will come largely from executive and regulatory - agency action, not Congress.

Congress is much the same as in past years, and will be slow to move in a new direction. It will grant some of the Kennedy team's broad programs, perhaps, but for the most part it will make few significant changes in established patterns.

There is little solace for the industry in this, however. The administration already has enough authority in its hands to take action which could have a great impact on oil: Import controls, fuels policy, regulatory agency policies, etc.

Therefore, the chief focus of attention should be on the men in a position to take major executive and regulatory action.

2. Policy "weathervanes"

The major policy decisions will be made by Kennedy and a small circle of close advisers.

For oil, some of the more important men to watch for an indication of direction include these:

. . . Stewart L. Udall, Secretary of Interior, is obviously in a key position to shape policy having a big impact on oil.

Udall has few set opinions about the industry at this point, but he is aware of the importance of oil and is eager to learn. Basically, he is not an "internationalist" and will therefore give emphasis to the need for a strong domestic industry.

At this stage, Udall is a "listener" as far as oil is concerned. He wants to hear all sides of the oil story before making major moves. But,

Karl S. Landstrom . . .

. . . directs the Bureau of Land Management, an agency of great importance to oil.

when he has heard, he will not be afraid to make decisions.

. . . **Douglas Dillon,** Secretary of Treasury, naturally is in a top position to shape policy on a problem highly important to oil: Taxes.

Dillon's oil views, like those of Udall, appear to be in the formative stage. On oil percentage depletion, for example, he has taken no positive stand. He has said, however, that the administration will make its views on this known by spring.

On gasoline taxes, the administration has already committed itself to at least a continuation of the present 4 cents, and may press for an increase to 4½ cents.

On depreciation, Dillon and other administration officials have endorsed the idea that a faster rate or more flexibility is desirable to encourage plant and equipment expansion.

Dillon's top aide, Henry H. Fowler, has been given unusual authority for an under secretary and undoubtedly will play an important role in shaping Treasury tax policies. He, too, favors liberalization of depreciation.

. . . **Robert Kennedy,** the President's brother, has two key roles. As attorney general he will naturally shape antitrust policy and enforcement. And, as his brother's chief political strategist, he will be involved with many other matters which could affect the industry directly or indirectly.

He appears to be primarily concerned with price-fixing, and is said to have been impressed with the anti-merger approach stressed by Robert Bicks, the acting assistant attorney general heading the antitrust division under Eisenhower.

. . . **James M. Landis,** a special assistant to the President, is already playing a major role in choosing men for regulatory agencies and in mapping plans for overhauling those agencies.

For oil, the Landis influence may bring grief. He obviously leans to a utility-type regulation of natural-gas producers, and the appointments already made to the Federal Power Commission reflect this view.

He talks, too, of more over-all energy planning, and has not ruled out end-use as a means to this end.

In public speeches he has referred to coal hydrogenation as a distinct fuels possibility that should be looked into further as an energy source.

The Landis approach may have some benefit for the industry, however, if he is able to speed up the disposition of cases by the regulatory agencies. And Landis has termed that a top-priority goal.

. . . **Others:** Walter Heller, Kennedy's chief economics adviser, and George McGhee, an assistant secretary of state who will have a key role in developing policy on international oil issues. McGhee is a Texan, and is familiar with the oil industry.

3. Implementation

Below the top level of policy makers are numerous key men who will have responsibility for helping put into effect the various programs that are developed. Some of the more important of these men, particularly from oil's viewpoint, are:

. . . **John M. Kelly,** expected to be Interior Department's assistant secretary for minerals.

Secretary Udall will lean heavily on Kelly, particularly while formulating his own views on oil.

Kelly is an independent oil operator from New Mexico. He fits the Kennedy-team pattern of being a hard-driving but practical man who will listen to all sides but will not let that result in inaction.

. . . **Karl S. Landstrom,** a career conservationist, will be the new director of the oil-important Bureau of Land Management.

. . . **Frank B. Ellis,** a Louisiana attorney, has been selected as director of the Office of Civil and Defense Mobilization and therefore will deal with key oil issues, including broad oil-import-control policies.

. . . **Mortimer Caplin,** who is to head the Internal Revenue Service, is one of several new Kennedy appointees who has criticized oil's percentage depletion.

However, as head of the IRS he will be in more of an administrative role, rather than a policy-maker. At any rate, it would require action by Congress to change percentage depletion.

Kennedy has picked Stanley Surrey, a Harvard Law School professor, for assistant secretary of the Treasury to help handle administration tax policies. Like Caplin, Surrey has been critical of percentage depletion rates.

4. Regulation

Right now, the industry has cause for some worry because of the obvious "consumer" attitude of the two men recently appointed to the FPC (OGJ, Feb. 6, p. 80).

. . . **Joseph C. Swidler,** Kennedy's choice for FPC chairman, is an attorney with a background steeped in the Tennessee Valley Authority.

There may be stout opposition to Swidler's appointment, for some congressmen privately consider that Swidler has a "socialist" viewpoint on natural resources.

. . . **Howard Morgan,** the other new appointee to the FPC, is classed as a public-power man in electric-utility circles because of his record while serving as utilities commissioner of Oregon.

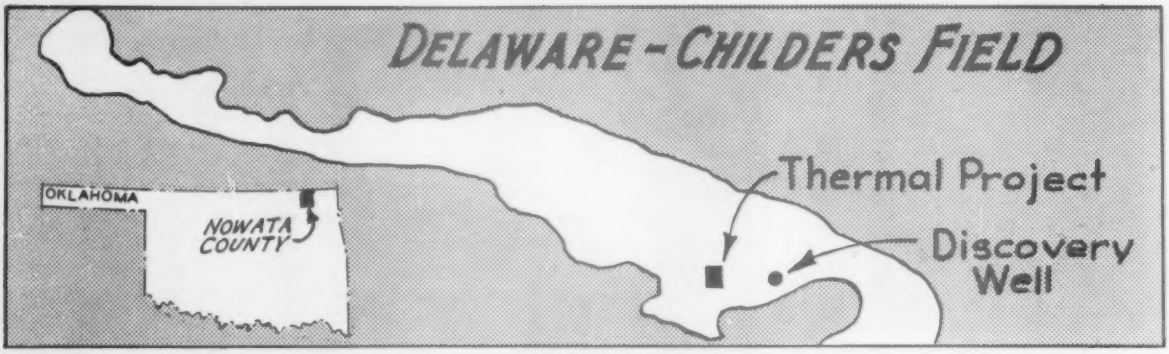
Kennedy has named Paul Rand Dixon chairman of the FTC and Philip Elman a member of that agency. He said he would name Everett MacIntyre to the next vacancy that turns up at FTC.

Dixon, chief counsel of the Senate Antitrust Subcommittee, is widely regarded as a liberal on antitrust matters.

Elman has been in the Solicitor General's office at the Department of Justice, which he joined in 1946.

MacIntyre is general counsel of the House Small Business Committee.

Both Dixon and MacIntyre, possibly reflecting the views of their sponsors at the capitol, have been among the foremost advocates of S. 11 and H.R. 11, identical measures to regulate pricing practices.



Sinclair to Fire-Flood 36°-Gravity Field

- If the Delaware-Childers pilot project pans out, Sinclair expects to reap another 35,000,000 bbl. from a 55-year-old field which already has undergone primary recovery, gas repressuring, and water-flooding.

SINCLAIR has the idea that in situ combustion will work just as well in a high-gravity field as in any other.

It's putting the idea to test now in Delaware-Childers field in Nowata County, Oklahoma.

This veteran field—55 years old next July—has been repressured with gas and water flooded. The pilot fire flood, if it performs well and is extended to the rest of the field, could well produce almost as much more oil as all other efforts to date—and in much less time.

Oil in Delaware - Childers field has a gravity of 36°. Few fire floods to date have been started in fields with a gravity above 20°.

Sinclair Oil & Gas Co. has owned the bulk of the field since its discovery in 1906 and already has seen it produce:

. . . **14,522,000 bbl.** of oil by primary means between 1906 and 1925.

. . . **13,471,000 bbl.** through gas repressuring between 1925 and 1948.

. . . **9,900,000 bbl.** through water flooding between 1948 and February 1, 1961.

Total recovery to date: 37,800,000 bbl. And Sinclair figures there's another 35,000,000 bbl. or more still in the reservoir.

Significant test . . . The Delaware-Childers pilot fire flood is the only one now being operated by Sinclair.

This gives it stature as an all-out test of the thermal processes in an old, shallow field which already has responded well to accepted conventional oil-recovery methods.

Only last year did Sinclair Research complete an intensive 5-year testing program in heat recoveries in its Humboldt, Kans., field project (OGJ, Sept., 26, '60, p. 113).

This experiment gave the company cost and recovery figures useful in making comparisons with gas repressuring, water flood, and other secondary results.

The speed with which engineers hope to recover crude by fire flooding figures prominently in economic studies.

Those operating water flood programs in marginal fields, which now are nearing economic limits of operation, will watch the Sinclair test with interest.

If the reservoir should respond to thermal recovery, reappraisals of other flooded fields would be a natural step.

It's a pioneer . . . Delaware-Childers was one of the first fields in Oklahoma to be gas-repressured and then water-flooded.

In a report made public in April, 1959, Steve F. DeVore and Dan E. Fitzgerald of Sinclair Oil & Gas Co., Tulsa, said:

"The success of these secondary-recovery operations was outstanding.

"For the entire group of leases, primary recovery was about 14,522,800 bbl. of oil; gas-repressuring recovery was about 13,471,000 bbl. and water flood recovery should be about 11,370,600 bbl. Secondary recovery, thus, will be about 1.7 times greater than primary recovery.

"Undoubtedly, many gas repressuring projects and water floods were installed in the Mid-Continent area as a result of the success in the Delaware-Childers field.

"Gas repressuring was begun in 1925 and continued for over 20 years with remarkable profit," the DeVore - Fitzgerald report cited. After these two successful cycles, (primary and gas - repressuring) water flooding spread over the field in 1948."

And as if it might have been a prophetic postscript, they added:

"Although recovery has been relatively efficient in this field, about one half of the original oil in place is yet unrecovered and remains a challenge for the future." Fire flooding is accepting the challenge.

An early start . . . The field's discovery well, No. 1 Ida Tanner, in Section 36-27n-16e, Nowata county, was completed July 26, 1906, at 640 ft.

Most of the field was developed by 1911.

The Bartlesville sand in the field is a lenticular - bar type deposit. Average porosity is about 20%, and average permeability is about 85 md. Vertically, the producing sand is divided into a thick, fairly uniform, lower sand and a thin, broken upper sand. The lower sand is the principal oil reservoir.

Gas Wildcatting's Up, But Maybe Not Enough

• Natural gas customers and demand have been increasing at such a rapid rate, a bigger gas hunt may be needed.

OPERATORS are wildcatting more for gas production at the expense of crude, but gas exploration still falls short of future needs.

Drilling records for the last few years reveal this sharp wildcatting trend toward gas, even though the volume of wildcatting for crude is still by far the greater.

Prior to 1951 the push to establish oil reserves was so vigorous that any evidence of a search for gas got lost in the shuffle.

But since 1951, there has been a definite trend toward more gas wells in the over-all exploratory program. In that year 14.5% of all wildcat wells were completed as gas producers. The number moved up to 25.8% last year.

This trend, however, may not be steep enough.

If the number of natural-gas customers and the demand for gas both continue to climb at the postwar rate, someone is going to have to spend more money hunting for new gas reserves.

Consider these comparative statistics:

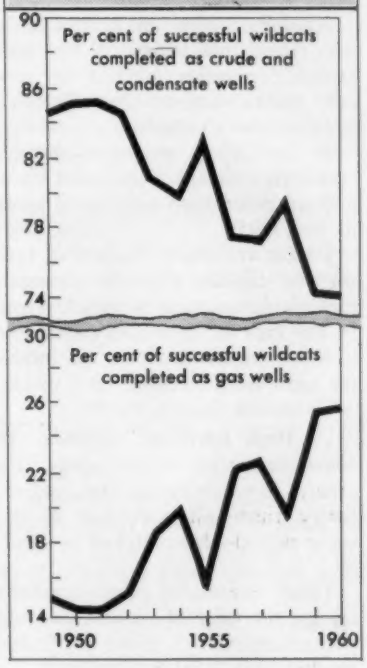
... **Sales** in 1960 were 3.2 times sales in 1946—a net gain of 220% in 14 years. The marketed production in figures was nearly 13 trillion cubic feet last year compared with 4.03 trillion in 1946.

... **Drilling** for gas last year totaled 3,952 wells for a gain of only 28% over the total reported in 1946.

... **Gas reserves** at the end of 1960 amounted to an estimated 273.4 trillion cubic feet, an increase of 70% over reserves at the end of 1946 (see p. 144).

Gas sales are not expected to increase at the inflated postwar rate. But even if demand should move up at only half that rate, someone will have to find more gas reserves.

Here's the Trend ...



Conoco Licenses Earth Shaker

A SURFACE vibrator system that generates seismic waves is ready to go to work for the oil industry.

Continental Oil Co. developed its "Vibroseis" method in domestic exploration and has now licensed Seismograph Service Corp., Tulsa, to offer the service in certain foreign areas.

Continental's president, L. F. McCollum, said in Houston last week that many geophysicists regard the technique as "one of the most significant break-throughs in seismic exploration science in the past two decades."

The first announcement of the method was made nearly 2 years ago at a meeting in Ponca City, Okla., of the Tulsa Geophysical Society (OGJ, April 14, 1958, p. 79). Since then Continental has conducted additional tests and made certain changes in the system.

How it works ... Continental released only sketchy information on the "Vibroseis."

Basically it consists of surface vibrating units which create seismic waves, thus eliminating the need for drilling shot holes and using explosive charges. It also differs from the weight-dropping method.

"Under the system, new model vibrators allow the geophysicist to control closely the signal sent into the earth," Continental said. "This gives him a choice of the signal best suited to the geologic conditions of the area he wishes to explore.

"Several synchronous vibrator units may be used simultaneously, allowing difficult areas to be covered more rapidly and less expensively than by other seismic techniques."

The system should be a money saver because it cuts down on the transportation costs and eliminates the need for dynamite, drilling supplies, and water. Also it eliminates the hazard of damage by explosives.

When the "Vibroseis" method was described 2 years ago, the inventors said a mechanical earth vibrator was mounted on a steel-wheeled trailer which could be loaded on the bed of the truck for movement between locations.

Powered by an electric motor, the vibrator has counterrotating weights contained within a vibrator box only 18 in. long. The weights can pound the earth at a force up to 14,000 lb. at a frequency of 60 cycles per second.

The system records sound waves on magnetic tape, and an electronic computer charts them.

The two inventors are John M. Crawford and William E. N. Doty.

Continental did not say whether the system would be made available for general domestic use, but Seismograph Service will use it abroad.

President G. H. Westby of Seismograph said "Vibroseis" will be offered by the company's overseas divisions as quickly as possible.

'60 Oil Profits Up for Most Companies, at

PACED by brisk activity in the last quarter, oil companies generally turned 1960 into a good profit year.

Announcements on annual business reveal that several of the integrated companies marked up record profits—among them Texaco, Phillips, and Continental.

A few others recorded all-time operating volumes. And most show a sharp percentage increase in profits over 1959.

Executives offer a variety of reasons to explain why their companies displayed such economic vigor in the face of tightened conditions in some segments of the oil industry and over the country as a whole.

Favorable factors include:

...High operating volumes. In some instances record sales, increases in crude production, and refinery runs—all occurring in the same period—have kicked up profits.

Other executives place emphasis on greater sales of natural gas and petrochemicals. A more profitable product mix is also mentioned.

...Reduced operational expenses. Many oil companies have actually started reaping the first harvest in profits from economy programs instituted months ago.

Several executives single out improved internal-cost conditions as one reason for larger profits. Others mention savings from a drop in intangible development costs, greater success ratio in exploration, and less capital spending.

How Companies Fared

	Net Profits (In thousands of dollars)		% Change	Per Share Earnings (In dollars)	
	1959	1960		1959	1960
Jersey Standard	630,000	688,000	9.2	2.93	3.18
Texaco	354,346	391,750	10.6	5.85	6.34
California Standard	253,599	266,000	4.9	4.01	4.21
Socony Mobil	164,000	182,500	11.3	3.38	3.76
Indiana Standard	139,597	144,750	3.7	3.90	4.05
Shell	147,418	144,580	−1.9	2.43	2.39
Phillips	104,639	112,400	7.4	3.05	3.27
Continental	60,300	61,200	1.5	2.85	2.90
Sinclair	45,526	52,400	15.1	2.93	3.41
Sun	42,844	49,273	15.0	3.48	3.78
Atlantic Refining	30,174	46,566	54.3	3.19	5.00
Ohio	38,633	39,215	1.5	2.76	2.84
Union Oil	27,515	34,000	23.6	3.16	3.95
Ashland*	14,349	14,927	4.0	2.09	2.12
Texas Pacific	7,197	7,778	8.1	1.85	2.00

*Fiscal year ended September 30.

Heavy volumes . . . Texaco, which had a 10.6% increase in earnings to $391.7 million, is among the companies reporting record-high operations in 1960.

"Records were established in every phase of our operations," Texaco Chairman Augustus C. Long declares. These include 4.6% gains in net crude production, 5.9% gains in refinery runs, and 4.6% more product sales.

Largest product-sales volume in the company's history is reported by Indiana Standard, which also established new highs in sale of natural gas.

"Standard Oil's profit gain for the last year was achieved in the second half," President John E. Swearingen says. "It was largely attributable to improvement in the depressed product prices that existed in 1959. We are hopeful that these increases can be held in 1961, to offset higher wages and other costs."

Jersey Standard President M. J. Rathbone attributes his company's gain in earnings to a 5% increase in world-wide product sales. The company also showed good gains in sales of petrochemicals and natural gas, especially in the United States.

Factors contributing to Continental's record earnings include higher crude-oil production, a reduction in the provision for federal income taxes, and a decrease in intangible development costs which the company charges off as incurred. Continental's crude-oil production and refined-products sales were the largest in its history.

Sinclair's sharp upturn in profits partially resulted from a new high in total sales and a substantial increase in earnings from petrochemical and natural-gas sales, Chairman P. C. Spencer says.

California Standard reports gains in production and sales on a world-wide basis. Volume of petroleum-products sales was up 7% in the Western Hemisphere; natural-gas sales were up 23%, and chemicals up 8%.

Economy payoff . . . Executives of the larger companies especially stress the effects of economy programs in higher earnings.

Indiana Standard's Swearingen notes that "economies arising from the company's program of cost reduction continue to be a factor in better earnings." Jersey's Rathbone also reports that continued emphasis on control of operating costs contributes to profits.

Management spokesmen of Continental, Sinclair, Atlantic Refining, and California Standard also lay particular stress on economies.

Two executives—Texaco's Long and California Standard Chairman R. G. Follis—predict another good year for oil in 1961.

Long expects consumer demand in the United States to increase another 2 to 3% this year, with an increase of about 7% in the free foreign world outside the United States.

Follis anticipates further improvement during 1961 despite the mild economic slowdown that he believes will persist through the spring.

He says his company's capital ex-

Peak for Some

penditures this year will exceed $400 million compared with $370 million in 1960. Nearly two-thirds of the outlay will go for exploration and development of crude-oil resources. A sizable portion also will be used to build new chemical plants.

Phillips Petroleum earnings should again set a new high during 1961 for the third consecutive year, Chairman K. S. Adams and President Paul Endacott report. The company's 1960 record stemmed from higher profits in chemicals, natural gas, and Venezuelan crude oil and from reduced operating costs. The executives say they expect similar trends to continue this year, plus a decline in capital expenditures.

Atlantic Refining President Henderson Supplee may sum up the feeling of many company executives when he notes that "during the past year, the petroleum industry has shown more responsible management of both crude-oil supplies and refinery output."

He adds: "If the industry continues to exercise this restraint, prices should remain favorable in the months ahead."

Rocks Springs May Hit Snag

PROTESTS by the City of Denver and State of Colorado may hold up a key portion of the Rock Springs project to move Texas and Oklahoma gas to California and the Rockies.

City and state officials have asked FPC to reconsider its approval of the project. They contend that it would add to the capital investment of Colorado Interstate Gas Co., on which the company may earn 6% or more, and that needs of Colorado consumers could be met more cheaply.

Colorado Interstate claims that its plan would be cheaper than other alternatives.

If rehearings are granted, construction work may not get under way this year. The 155-mile, 34-in. line from Rock Springs, Wyo., to Provo, Utah, would cost $92,829,-446.

watching WASHINGTON

Clyde La Motte

• Should oil men take Government oil-policy jobs? . . .

SOME OIL PEOPLE had misgivings when they heard that John M. Kelly was being tabbed for Interior's assistant secretary for minerals.

It wasn't that they were unhappy over the selection of Kelly. They simply had doubts that an oil man should take a spot so high in Government circles, for undoubtedly Kelly will have an extremely important role in matters affecting the oil and gas industry.

Their argument is that an oil man appointed to such a post immediately becomes the target of the anti-oil crowd, and that any Interior action affecting oil will be subject to suspicion.

The word is that Secretary Stewart L. Udall was given this line of reasoning but that he didn't buy it.

• Interior wants all the help it can get on oil . . .

THE UDALL LOGIC runs something like this:

Udall needs, and the administration needs, someone with some oil savvy. It's pretty obvious that Interior is facing and will continue to face some tough oil problems.

It can face these problems better if it has on hand someone who is familiar with them.

Furthermore, the oil industry isn't doing itself any favor by shying away from oil policy-making roles in the Government.

Sure, there will be critics, for there is a faction of politicians who make mileage out of attacks on the industry.

Other industries have been under a similar gun in the past. But plenty of men came from those industries to Washington and won respect.

Oil men can, and do, have as much patriotism and interest in the nation's welfare as others. Oil men can assume a government role and be as fair-minded as anyone else.

So maybe it is time for industry leaders to be a little less skittish about accepting top Government assignments.

• Udall lines up sources of advice on oil issues . . .

HERE IS THE WAY things are shaping up at Interior:

Secretary Udall will use Kelly (if that planned appointment goes through) as his No. 1 oil adviser in the department.

He has appointed J. R. Parten, director of Pure Oil and former president of Woodley Petroleum, as a consultant on oil and gas matters. In addition, Udall is going to ask another oil man or two to come in for a time in advisory roles.

Udall may also turn to his temporary Indian commissioner, W. W. (Bill) Keeler, who is on 90-day leave from Phillips Petroleum Co. to help Udall get things lined up on Indian affairs. Udall, aware of Keeler's oil-industry and government-industry background, plans to get Keeler's views on oil, too, while the latter is in town.

Finally, Udall has definite plans to seek out representative spokesmen from all segments of the industry so he will be sure to get a fair cross-section of oil views and oil problems.

Udall plans to make the decisions, but he wants all the data he can get before he begins any journey out on a limb.

For Gasoline Makers, the Problems Keep

IT'S GETTING HARDER for the man in the laboratory to determine how gasolines will perform in automobile engines.

Changes in motor design and fuel composition are creating new problems. For 30 years a gasoline's quality, as determined by the engine, has meant essentially octane number. But this factor alone can't be used as a yardstick nowadays.

Colorful terms like rumble, thud, thump, pre-ignition, hot-spot ignition, and crunch are used to describe abnormal combustion conditions not entirely related to a gasoline's octane rating.

Octane numbers probably will continue to be the most important single property. But even here better test methods are needed.

Research along these lines was covered in a symposium sponsored by the American Society for Testing Materials in Philadelphia last week.

The situation, as summed up by Dr. D. P. Barnard, retired Standard Oil Co. (Ind.) researcher:

. . . Fuel - volatility developments which might require new test procedures do not appear likely, nor do specification changes appear to be imminent.

. . . Knock-test methods could stand increased precision, decreased complexity and, perhaps, a continuous scale to include the range above 100 octane number.

. . . Development-test procedures are needed for almost every phase of fuel - quality improvement—particularly in the area of knock-rating interpretation and abnormal combustion other than conventional knock.

. . . Fuel-stability-test procedures, as presently used, need more positive interpretation data. They may require revision as additives and other manufacturing-chemistry developments occur.

. . . Accidental fuel contamination may require a specific test. This, however, would necessarily be applied at the point of use.

As to the possible effect of fuel development on specifications:

Changes in volatility specifications do not seem imminent.

Refinements of knock-testing procedures may require a new system of "numbers" as the logical result of new calibrations.

Specifications of abnormal combustion properties, other than knock, seem a long way off, indeed.

Changes in standardized stability specifications and provisions against chance dirt do not appear probable in the near future.

Changes in composition . . . The continuing demand for high-octane number will dictate increased use of isoparaffins and limit the use of other high-octane components, W. J. Faust of Universal Oil Products Co. told the group.

To meet this much greater demand, he forecast use of the alkylation process will increase until no C_3 or C_4 olefins are burned as refinery fuel.

"The economic trend that will force refiners into total propylene recovery may be rather long range, but it appears to be inevitable," he declared, adding:

"With increasing emphasis on motor - method ratings, polymer gasoline will tend to be replaced by alkylate to the full extent to which the olefins can be made available."

Molecular sieves also will find wider use, Faust said, because the process raises gasoline quality and also because the normal co-product qualifies as a superior jet-fuel component.

Antiknock performance . . . Most pressing need, according to several of the ASTM speakers, is a laboratory test which will better predict a gasoline's antiknock performance in an automobile.

When the Research and Motor methods were adopted, their design features and operating conditions were similar to the auto engines then in use. Since this similarity no longer exists, the accuracy of both ratings is poor.

Good antiknock predictions require empirically developed correlations which include such factors as the olefin, lead-alkyl, surfur, aromatic, and paraffin contents of the motor fuel.

Importance of additives . . . The widespread use of additives in motor gasoline is causing problems but additives are here to stay, in the opinion of John M. Dempster, Standard Oil Co. (Ohio).

According to recent estimates, more than $500 million was spent last year for petroleum additives. About three-fourths of this was for motor-gasoline and diesel-fuel additives, including 7.1 million pounds of organics as anti-oxidants, 2.5 million pounds of elemental phosphorus, and 4.3 million pounds of organic chemicals as rust inhibitors.

Extent of their use is further emphasized by the fact that today's premium contains from 4 to 10 additives. Over 75% of the premium fuels currently marketed contains a phosphorus additive to combat pre-ignition.

Results of a recent survey of 12 premium gasolines marketed in the Middle West bears this out (see table).

Some problems are caused by additives, even though they are generally minor. Among those cited by Dempster were:

. . . Sediments which cause deposits in the fuel line, carburetor, and combustion chamber. Some deposits are caused by incompatibility between additives.

PROCESSING

A $3 million gas-processing plant will be built by Union Pacific Railroad in the Patrick Draw field, Sweetwater County, Wyo. to help conserve natural gas which has been flared at the rate of 27,000 M.c.f. daily.

High - pressure polyethylene capacity at Monsanto's Texas City plant is being expanded by 30%. Completion is set for early 1962.

A natural gas processing plant with capacity of 150 million cubic feet daily will be built near Port Arthur, Tex., by Port Gas and Processing, a division of Hudson Gas and Oil. Completion is due in

Changing

... **Handling requirements** are increased, particularly where gasoline exchange arrangements exist with other refiners.

Other problems arise from storage requirements, handling of toxic materials, and increased development costs.

Some of these problems can be solved through the use of multipurpose type additives, or additive packages pre-blended to the user's specifications.

Future engines ... Abnormal ignition disturbance will become an increasing problem in engines of future cars if compression ratios go higher. This was the opinion expressed by T. H. Risk and A. E. Cleveland, Ford Motor Co., in discussing future engines and their fuel requirements.

As they see it, the engine of the future should be designed to:

... **Be more economical,** probably by increased compression ratio and by leaner carburetion, with more severe settings of valves and spark.

... **Have more power** for a given weight and package size, be more compact, and consequently have greater heat loading per unit of surface area.

... **Operate efficiently** at higher speeds, with consequent shorter cooling cycles on highly heat-loaded parts.

... **Require less service.** It should be suitable for packaging for best product design, rather than for engine serviceability.

These future engines will have likes and dislikes similar to present engines. Therefore, the fuel to power this car should be formulated to:

... **Be capable** of maintaining quiet, normal combustion under the more severe engine conditions that tend to promote abnormal combustion and detonation.

... **Have volatility** characteristics which are controlled to give improved economy.

... **Be free of dirt,** both entrained dirt and that resulting from combustion.

As to normal ignition disturbances, it is expected that usable yardsticks will soon be available, and that:

"These values may well become another set of numbers to designate the resistance of fuels to sustained hot-spot ignition and to deposit ignition. These numbers, like the octane numbers, will probably be based on the engine's fuel requirements and compared to some fixed reference standard of engine antiknock. The current lead-in-benzene (LIB) scale is a first approach to such a measurement."

Additives—New Factor in Fuel Tests

• Current fuel-stability testing may have to be revised to interpret data more positively as the use of additives grows. Increasing popularity of additives is shown in this survey of 12 premium gasolines in the Midwest.

Additive / Company	A	B	C	D	E	F	G	H	I	J	K	L
Deposit Modifier		✓	✓	✓	✓	✓		✓	✓	✓	✓	✓
Top Cylinder Lube			✓	✓						✓	✓	
Fuel-Line Freezing	✓		✓	✓				✓	✓	✓	✓	✓
Carburetor Anti-Icer	✓		✓	✓		✓		✓	✓	✓	✓	✓
Carburetor Detergent	✓		✓	✓		✓		✓	✓	✓	✓	✓
Rust Inhibitor	✓		✓	✓	✓	✓	✓	✓	✓	✓	✓	✓
Anti-Oxidant	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓
Metal Deactivator	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓
Combustion Modifier									✓		✓	
Bactericide											✓	

BRIEFS ...

midyear. Production, consisting of ethane-propane mix, butanes, and natural gasoline, will be sold to petrochemical plants in the area.

Canada's largest benzene plant is a step nearer reality with the awarding of the main contract for construction of a $5-million facility at Imperial Oil's Sarnia refinery. Canadian Bechtel, Ltd., got the contract for the 30,000,000-gal.-a-year plant and will start work this spring.

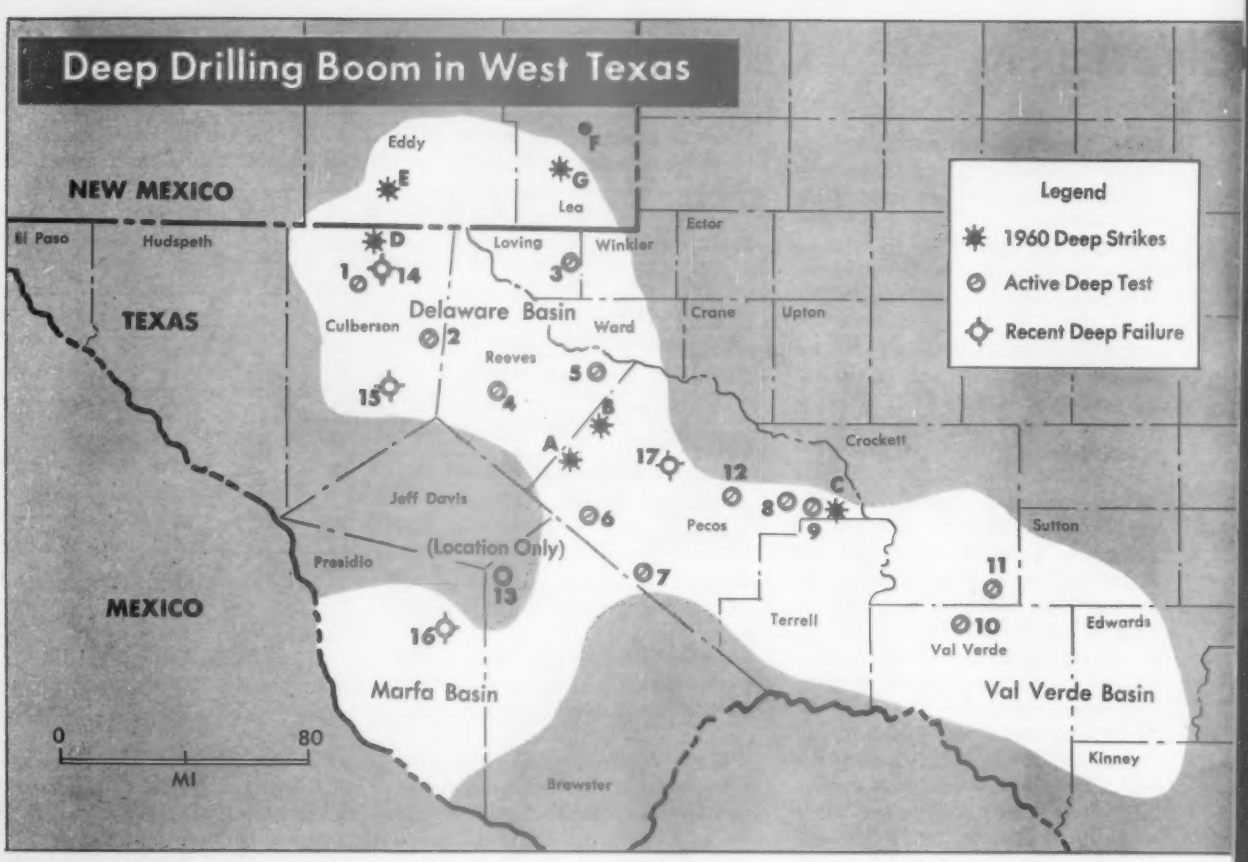
Acetyl chemicals plant will be built by Celanese Chemicals Division of Celanese Corp. near Bay City, Tex. Initial production will include 2-ethyl hexanol and acetaldehyde, which will be produced from ethylene and oxygen by a new process licensed from Aldehyd, G.m.b.H. Brown & Root, Inc., has the construction contract and completion is expected in the spring of 1962.

Damage to a dehydration plant of Arkansas-Louisiana Gas Co. at Hallsville, Tex., from an explosion and fire January 27 has been estimated at more than $250,000. No one was injured. Cause of the blast and fire was undetermined.

A natural-gasoline plant was recently completed by California Oil Co., western division, in the Red Wash field, Uintah County, Utah. A high-dewpoint-depression glycol dehydrator and ammonia-absorption refrigeration unit processes 26,000,000 cu. ft. of gas daily.

A new Udex extraction unit to make benzene at the Texas City refinery of the Republic Division of Plymouth Oil Co. will be constructed at a cost of $2.5 million. The unit will go on stream about July 1.

An aromatics unit will be constructed by Atlantic Refining and Pure Oil this year at Pure's Nederland, Tex., refinery. Atlantic will have a 50% share in the unit, which will produce benzene as the primary product and supplement with toluene and xylene. Capacity will be 50 million gallons a year.



Delaware-Val Verde Tests Shoot for New

Robert J. Enright
District Editor

THE long-awaited deep-drilling play in West Texas' vast, remote Delaware-Val Verde basin area is under way.

In fact, it's bursting out all over.

Last week, at least a dozen rank wildcats scattered throughout this region were headed for pre-Pennsylvanian targets ranging down to 20,000 ft. Some of the tests already appear to have found possible commercial production.

At least four other deep tests—the deepest a 16,470-ft. failure by Humble Oil & Refining Co. in Pecos County—were plugged last month.

Still more wildcats are aiming at shallower pre-Permian beds.

All this is a great change. A few years back nearly all drilling activity was confined to depths less than 5,000 ft. with the Delaware sand as the principal target.

Six significant strikes . . . Though operator interest in the basin's deeper horizons has climbed steadily for several years, it was fanned to its present flame largely by half a dozen significant and widely separated strikes in 1960.

Three big gas fields were brought in last year in sprawling Pecos County in the eastern portion of the Delaware basin.

Intensely interesting to wildcatters was Mobil Oil Co.'s discovery of Rojo Caballos field (B on map), with its 1 Kathleen Moore. This prolific Pennsylvanian strike potentialed 102,000,000 cu. ft. of gas daily from 15,041-47 ft. Shut-in bottom-hole pressure was an astonishing 12,590 psi.—high even for the Gulf Coast but unapproached and unimagined in West Texas.

Atlantic Refining Co. scored heavily with its 1 Kelly to bring in Hershey field (A on map), 30 miles west of Fort Stockton. This is Texas' deepest production.

This find gaged gas flows of up to 20,000,000 cu. ft. daily from Devonian, Silurian, Fusselman, and Montoya between 15,800 and 16,680 ft.

Shell and Humble brought in the third Pecos thumper with their 1 Blackstone-Slaughter 6 miles west of Sheffield (C on map). Another multipay strike—now officially dubbed Yucca Butte field—the find potentialed for a total of more than 30,000,000 cu. ft. daily from the Ellenburger, Connel (Simpson), and Pennsylvanian Detrital between 9,993-10,092 ft.

Many miles away on the northwest side of the basin, Mobil hit again with its 1 State-Barrett (D on map), in Culberson County. Potential was 13,500,000 cu. ft. daily from the Pennsylvanian Strawn at 5,814-47 ft.

Gulf Oil Corp. brought in its 1

Pre-Penn Tests in Delaware-Val Verde Area

Code	Wildcat	Target Zone	Contract Depth, Status
1.	Humble 1 Sibley	Strawn, Ellenburger	7,100; active (tight hole)
2.	Tidewater 1 Delaware Basin Properties	Ellenburger	Below 12,000
3.	Rhoden 1 Linebarry	Devonian	18,500; active
4.	El Paso 1 Caldwell	Ellenburger	13,500; active
5.	Gulf 2 R. Cleveland	Devonian	18,700; gas flows; below 7,000
6.	Hunt 56 Elsinore	Ellenburger	18,000; flowing gas; on completion; TD 16,735
7.	Forest, Lone Star 1 Moore	Devonian	8,600; active
8.	Humble 1 Harral	Ellenburger	13,100; below 5,200
9.	Penrose, Kern 1 Rashop	Ellenburger	12,500; below 10,200
10.	Phillips 1 Mayfield A	Ellenburger	14,500; below 15,000
11.	Honolulu 1 Adams	Ellenburger	12,500; gas flows tested at 11,-144-11,230
12.	Southern Minerals, General Crude Oil 1A Jasper County	Ellenburger	11,000; apparent gas-distillate strike at 10,440-10,540; flow 160,000 M.c.f. TD 10,590
	INACTIVE		
13.	Mid-America 1-43 Meriwether	Not announced	Not announced
	RECENT FAILURES		
14.	TXL 1 B. T. Culbertson	Simpson	Plugged at 12,630
15.	Canter-Hamm-O'Brien 1 Foster	Ellenburger	Plugged at 6,705
16.	Gulf 1 Hubbard	Middle Ordovician	Plugged at 10,132
17.	Humble 1 Tyrell	Fusselman-Montoya	Plugged at 16,470

Gas Reserves

A. D. Estill (E on map), in Eddy County, New Mexico, for 46,800,-000 cu. ft. daily from the Permian-Wolfcamp at 9,806-16 ft.

And on the northeast Ohio Oil Co. came up with a big oiler at its 1 Lea unit Federal in Lea County, New Mexico (F on map). This one completed for 516 bbl. daily from the Permian-Bone Spring at 9,480-9,550 ft. and the Devonian at 14,347-14,489 ft.

There is some disagreement on the geological province but most feel the strike is in a north-jutting arm of the Delaware basin.

A seventh important well, Continental Oil Co.'s 6 Bell Lake unit (G on map), gave further kick to the Delaware basin play on its northeastern rim. A long 4-mile stepout to the north, the 6 Bell Lake unit in Lea County, came in for 30,500,000 cu. ft. from the Devonian at 14,568-14,829 ft.

Gas is target . . . You'll note that of these seven important holes six are producing gas—and lots of it.

Furthermore, the few significant strikes made prior to 1960 in the region have been gas finds. They include Conoco's Bell Lake unit Devonian discovery in 1955, and El Paso Natural Gas Co.'s Welch Pennsylvanian success in Eddy County just north of the Texas line in 1956. And Mobil's sensational Brown-Bassett strike in Terrell County far to the southeast was made in 1957.

The odds appear heavy that deep drilling in the Delaware and Val Verde basins will, if successful, find gas much more often than oil.

This gassy atmosphere has been a prime stimulant to the region's current deep-drilling boom.

A division geologist for a major company in the forefront of the Delaware-Val Verde activity puts it this way:

"You're not looking for oil anymore in Texas when you drill wells below 14,000 ft. in an area like this."

He points out that payouts on costly deep oilers under current low Texas allowables have stretched out so far that such drilling is unattractive.

The chief geologist for a second major operator in the area doesn't put it so strongly. But he leaves no doubt that his company is looking for gas when it drills there.

Drilling costs high . . . And drilling in these basins is costly. Formations are extremely hard. Deep-test drilling costs of $3,000 and more a day are normal.

Field wells in giant Brown-Bassett, for instance, are costing nearly $500,000 each to drill and complete in the Ellenburger at around 14,000 ft.

High drilling costs, coupled with natural barriers to scientific prospecting, are the reasons why the Delaware-Val Verde region is just now coming into its own. Operators were reluctant to tackle it—even though experts predicted for years that the province has a producing potential equal to or greater than the prolific Midland basin to the north.

Much of the Delaware region is overlain with "valley fill," a thick layer of alluvium eroded from an ancient mountain range. In past years, this has made it hard to get good seismic records of the basin's deep beds.

Better instrumentation and techniques have eased this problem recently.

No flash in the pan . . . The burst of drilling now going on in this remote country is not the firecracker type that flares and dies quickly.

All indications are that deep exploration there will continue steadily for a long time.

In 1960, for instance, according to figures of one major company, seismic activity in the region totaled a swollen 2,100 crew weeks. This averages out to about 40 crews working steadily throughout the year.

And that fast pace is being maintained so far this year.

Late in January, there were 14 crews working in Pecos County, 8 in Val Verde County, 4 each in

Terrell and Culberson counties, 3 in Reeves, 2 each in Loving, Brewster, and Edwards, and 1 in Jeff Davis.

Development humming . . . Semi-wildcatting continues strongly around the deep gas strikes of 1960.

At Rojo Caballos, Mobil Oil has bottomed out its 1 Weatherby 1 mile east of the discovery. The company will not acidize or potential the well until an outlet for the field is nearer. But Mobil feels the 1 Weatherby will produce on a par with the 1 Moore.

Another stepout a mile southwest of the discovery, the 1 Schlosser, last week was nearing 16,000 ft. on a contract depth of 20,000 ft. In the first two wells Mobil was unsuccessful in its efforts to test such deeper prospects as the Devonian, Montoya, Fusselman, Silurian, Simpson, and Ellenburger. It hopes to make it in the 1 Schlosser.

Gulf will spud in an extension try soon 1 mile east of the 1 Weatherby.

To the southwest, Atlantic is well along on two extenders to its prolific 1 Kelly.

The company's 1 Lucas State, 2 miles east, was approaching 17,000 ft. last week in Fusselman-Montoya. It has already confirmed gas production in the Devonian. And its 1 Wilbanks Herschenson gas unit was drilling below 14,000 ft. in the Wolfcamp 1 mile northwest of the discovery.

At Yucca Butte field, Shell and Humble are completing their 1-A Blackstone-Slaughter in the Pennsylvanian detrital 1 mile west of the discovery. The extension found water in the Ellenburger—the prize zone of the discovery. However, its location, low on the structure, was dictated primarily by an acreage-holding consideration. And geologists for the operators feel Yucca Butte is going to be a large field areally.

Down in Terrell County, big Brown-Bassett now has 10 completions and is still not defined. Drilling is picking up this year now that El Paso Natural Gas Co. has started taking gas from the field. Five wells are drilling. Mobil, field discoverer, is putting down three, Shell and Sinclair one each.

Udall tells NPC:

Advice Wanted, but U. S. Will Set

OIL policy of the Kennedy administration is becoming a little clearer: Government participation in industry affairs will grow but officials will cooperate with industry leaders in making policy.

This was the tenor of remarks made by Secretary of Interior Stewart L. Udall in addressing his first meeting of the National Petroleum Council. The Government's top official in oil and gas said that his "growing familiarity with oil has bred respect."

Udall immediately made three moves in line with the new policy:

. . . Named himself as cochairman of the council, a group of more than 100 oil and gas leaders from all segments of the industry who advise the Government.

. . . Appointed J. R. Parten of Houston as a consultant for several weeks. Parten formerly was head of Woodley Petroleum Co. and now is a director of Pure Oil Co. Udall recalled that Parten had served Secretaries Ickes and Chapman in the past and noted: "He will help me in my thinking."

. . . Announced that W. W. Keeler of Phillips Petroleum Co. has agreed to serve the department for 90 days without compensation as chairman of a commission to set up a new Indian program (OGJ, Jan. 23, p. 156).

Happy remarks . . . Udall as cochairman of the council will raise its stature in Washington.

The move also indicated the two-way chairmanship of the body, started by former Secretary Fred A. Seaton at urging of the Department of Justice, is likely to continue. Capt. M. V. Carson, Jr., head of Interior's Office of Oil and Gas, had been serving as the government cochairman.

Udall made off-the-cuff remarks designed to start relations with the oil and gas men on a happy basis. He said he has been disturbed by a school of thought that oil is one industry lacking in public spirit and should not be asked to serve in this or any other administration.

"I take issue in this," he said, adding he sees no reason why oil and gas leaders are not as patriotic and helpful to the Government as those from any other industry.

He predicted the day will come when oil and gas leaders will "redeem the oil industry" in the eyes of Government and the public "just as James Forrestal redeemed Wall Street."

Udall also served notice that he is going to be the boss.

"We must have national policies on oil and gas, and these policies must be determined by public bodies which weigh the public interest," he asserted.

Udall emphasized that Interior "is the principal policy-making agent in this sphere" and added its "responsibilities will grow rather than diminish in coming years."

Udall promised to be completely direct, straightforward, candid, and specific with the oil and gas leaders now and in the future. He promised to try to be open minded.

In reply, Chairman Walter S. Hallanan recalled that the council was formed to meet a patriotic challenge and that "it blazed a trial of industry-government cooperation in a way that sets a high mark."

Hallanan, of Plymouth Oil Co., again was elected cochairman of the

PIPELINE

Third river crossing for the proposed Trans-Southern LPG pipeline from Texas to North Carolina is now under construction. Dual 10¾-in. crossings of the Mississippi near St. Francisville, La. along with dual 30-in. crossings for Transcontinental Gas Pipe Line are under way. Houston Contracting Co. is the contractor.

Eight loops averaging 8 miles each are included in the 1961 construction program of Columbia Gas System, which stretches from the Gulf Coast to Pennsylvania. Also planned is a 28.9-mile, 12-in. gathering line through marshes and open

Fuels Policy

council, a post he has held since it was started. R. G. Follis of Standard Oil Co. (Calif.) was reelected vice chairman. A. Jacobsen of Ameada Petroleum Corp. was reelected chairman of the agenda committee, and Frank Porter of the American Petroleum Institute was elected chairman of the appointments committee.

Interesting reports . . . In other action, the council heard:

. . . L. F. McCollum of Continental Oil Co. report on a current study of reserves and availability.

McCollum said that on January 1, 1960, the nation had a productive capacity of 10,585,000 bbl. daily of crude, 1,800,000 bbl. daily of natural-gas liquids, 51 billion cubic feet of natural gas daily from nonassociated wells, and up to 21 billion cubic feet of gas daily from associated wells.

. . . Vice Admiral Burton B. Biggs, director of petroleum logistics policy of the Defense Department, warn that industry and government planning must be strengthened. He asked for revival of the work of the Foreign Petroleum Supply Committee.

. . . John S. Stillman, special assistant to the under secretary of commerce, ask oil leaders to help in the drive to attract foreign tourists.

New record for multiples?

WHEN it comes to multiple completions, Humble is no piker.

The company has asked the Texas Railroad Commission to let it make 34 completions in only 8 holes.

It first asked for 17 completions in 4 wells in Borregos field in Kleberg County. A few days later it asked to make 17 more in 4 wells in North Alazan field in the same county.

The Borregos multiples include the world's first known sextuple oil completion in Humble's 167 King Ranch - Borregos. It would produce oil through three strings of 2⅞-in., and through three strings of 1¼-in. tubing inserted in the larger tubing, from zones between 5,100-6,400 ft.

This is the type of sextuple pioneered by Sunray last year. Sunray now has two—one producing all gas zones, the other both oil and gas.

The other Humble multiples include one triple and two quadruple oil completions in Borregos, and one quintuple oiler and three quadruples in North Alazan.

Two of the North Alazan quads will produce three oil zones and one gas pay. The other will produce oil from one zone and inject gas into the other three.

The North Alazan multiples were approved by the commission last week.

In an emergency . . .

Chemicals Essential to Refiners

DOMESTIC refiners could get along for 90 days without new maintenance supplies, but they would be severely crippled without a supply of process chemicals.

This is the report of the National Petroleum Council to the Secretary of Interior who requested the study for use in event of an emergency.

The study was made by a committee headed by Everett F. Wells of Ashland Oil & Refining Co.

The report stated that a majority of U. S. petroleum refineries would be able to operate at normal volume for at least 13 weeks without new supplies of maintenance materials.

Capacity to produce various products, however, would be limited to less than 90 days of normal operation.

Natural-gasoline plants would be affected far more, with from 30

BRIEFS . . .

water from a point near Houma, La., to the Texaco Dog Lake field.

A 10.5-mile 8-in. line to connect the Rounds and Porter gasoline plant with the main line in Marion County, Kansas, is planned by Cities Service Gas at a cost of $2,000,000. Another $675,000 will be spent on gathering lines in the Sterling field, Comanche County, Oklahoma, if FPC approves.

About 10,000,000 cu. ft. daily will be added to the 16-in. system through which Lone Star Gas supplies Dallas after completion of a planned 14.53-mile, 8-in. line connecting the company's system near Ardmore, Okla., with Pure Oil's gasoline plant in the Caddo field.

New transmission lines in Adams and Boulder counties of Colorado will be constructed by Colorado Wyoming Gas, if FPC grants approval. The 16.7-mile 16-in. line and attendant facilities would cost $640,000.

Permission for a 3.6-mile 6⅝-in. line to serve Armour Agricultural Chemical in Colbert County, Alabama, is being sought by Albama-Tennessee Natural Gas. The project would cost $131,000.

Also for Pipeliners . . .

IN THE NEWS: Wildcatting for gas is on the increase, but it's still not enough to keep up with growing gas demand (p. 49) . . . Westcoast Transmission pipeline project to move British Columbia crude into the Vancouver refinery market wins approval (p. 58) . . . Independents in Canada warn that if new government policy to increase domestic crude market doesn't work, they'll push for Montreal pipeline (p. 63).

PLUS THIS TECHNICAL REPORT: What's ahead in double jointing (p. 70).

to 50% of capacity for various products limited by inability to obtain outside maintenance supplies.

Bearings are one of the most critical items. They showed up most frequently in the list of more than 100 maintenance materials that are kept in short supply at the plants.

A cutoff in the supply of process chemicals would limit refinery operations far more sharply. The severity ranges from 98.4% of premium gasoline capacity limited to 44.1% of the asphalt capacity.

The product rundown under a 90-day cutoff in new chemicals:

	% of total capacity limited	Equivalent days of full production for limited plants
Premium gasoline	98.4	14
Regular gasoline	97.4	15
Aviation gasoline	93.2	17
Kerosine	87.9	28
Jet fuel (JP-4)	73.4	29
Distillate	69.7	31
Residual fuel	67.6	31
Lubricating oils	47.4	26

Natural-gasoline plants could get along better if process chemicals were cut off. Only 32 to 65% of capacity of those plants would be limited to less than 90 days of normal production. And these plants could continue production for 33 to 52 days of normal output.

Texas Considers New Gas Tax

● Governor backs higher gas production tax. Other bills affecting state levy on oil and gas are introduced.

A BILL which would hike the Texas gas production tax another 3%—to a total of 10% of wellhead value—has been introduced in the Texas house.

The bill, which has the backing of Gov. Price Daniel, would bring in an added $22,500,000 in gas taxes annually. The increase would last for 1 year only under terms of the bill.

The bill was one of several tax measures, either proposed or introduced in the legislature, which would affect the Texas petroleum industry.

A tax package proposed by Rep. Robert Eckhardt of Houston calls for:

... **A graduated tax** on production which would cut the rate to 4% for small operators and increase it sharply for the largest producers of Texas oil. Net effect would be to hike oil-tax revenue by about $18,000,000 a year.

... **A gas production tax** based on sales price—with the first purchaser of the gas paying the tax. Gas sold at a low price would bear the heaviest tax and vice versa.

The net effect, Eckhardt contends, would be to stabilize the amount of revenue to the state from each M.c.f. of gas. A purchaser getting "bargain rate" gas under an old contract would pay a much higher tax.

The Houston lawmaker estimates his proposal would bring in about $45,000,000 a year, with credit for payment of the present severance beneficiary tax reducing this total by about $7,500,000.

Import tax pushed . . . A resolution urging an oil-import tax of $1.50 a barrel is pending before the legislature.

The resolution was introduced by Rep. Scott Bailey of Cisco.

Another whack at imports was contained in a bill introduced by Rep. Jack Connell, Jr., Wichita Falls. This one would levy a tax of 15 cents a barrel on storage of oil imported from outside the U. S.

Other oil action . . . The Texas Legislative Council has thrown its weight behind a proposed bill which would declare a state policy against leasing highway right of ways for oil and gas development.

British Columbia Pipeline Project Approved

A COMPLETE TAKEOVER of the 75,000-bbl.-daily Vancouver, B. C., market by British Columbia crude and natural-gas liquids will be possible with the construction of a pipeline from Taylor, B. C., to Kamloops.

Premier W. A. C. Bennett last week announced approval of the 500-mile 12-in. line which Westcoast Transmission Co., Ltd., proposes to build at a cost of $30 million. The Westcoast application was selected over two competitors—Trans-Prairie Pipelines, Ltd., and Peace River Oil Pipe Line Co., Ltd. (OGJ, Jan. 23, p. 59).

Vancouver's four refineries, with combined capacity of 89,000 bbl. daily, are served entirely by Alberta crude, with current throughput running at 75,000 bbl. daily. Alberta may lose all of this market within 3 years.

The current throughput figure coincides with ultimate capacity of the Westcoast pipeline, which the company expects to start using by May 1. Initial throughput, including liquids from Westcoast's Taylor gasoline plant, are estimated at 20,000 bbl. daily.

The new Westcoast line will connect at Kamloops with Trans Mountain Oil Pipe Line Co.'s trunk line from Edmonton which now delivers Alberta crude to Vancouver.

It will receive oil from a 20,000-bbl.-daily gathering system being built by Trans-Prairie to link Beatton River, Doig River, Boundary Lake, and Milligan Creek fields to Fort St. John and Dawson Creek, B. C. The system is to be completed in September.

In an effort to stimulate northeastern British Columbia's oil development, which has lagged because of isolation from markets, Premier Bennett persuaded Vancouver refiners to take whatever volumes of B. C. crude could be delivered economically.

The refiners involved are Imperial Oil, Ltd.; British American Oil Co., Ltd.; Standard Oil Co. of B. C., Ltd.; and Shell Oil Co. of Canada, Ltd.

Principal producers in B. C. are Hudson's Bay Oil & Gas Co., Ltd.; Texaco Exploration Co.; Pacific Petroleums, Ltd.; and Union Oil Co. of California.

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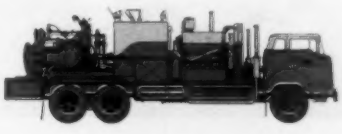

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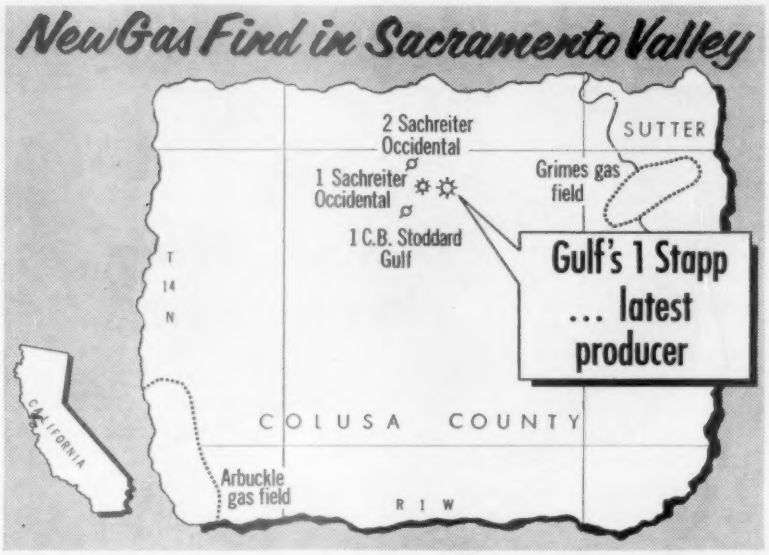


California Gas Pool Found

- Gulf hits in newly discovered West Grimes field, near Occidental well which touched off flurry of activity.

A NEW GAS POOL has been found in the West Grimes field which was discovered last December in Colusa County, one of the hot spots of California's Sacramento Valley gas play.

Gulf Oil Corp.'s 1 F. Stapp et al. in Sec. 3-14n-1w is ½ mile east of Occidental Petroleum Corp.'s 1 Sachreiter, the West Grimes discovery well.

The Gulf well was completed in a more shallow sand than the Occidental well. The 1 F. Stapp flowed at the rate of 4,378 M.c.f. daily through a ¼-in. choke, 7,939 M.c.f. daily through a ⅜-in. choke, and 10,542 M.c.f. daily through a ½-in. choke. Flow is from a 54-ft. perforated interval at 6,968-7,022 ft.

The Occidental well, which has stabilized at 17,250 M.c.f. daily through a ¾-in. choke, was completed in a 11-ft. F-2 (Upper Cretaceous) sand at 7,645-56 ft.

Occidental has spudded in two more wells—2 Sachreiter near the discovery, and 1 Arbini in San Joaquin County—in its search for more gas in northern California.

The 2 Sachreiter is a northwesterly offset to Occidental's initial well. It will be taken down about 8,500 ft. The offset is in Sec. 4-14n-1w of the West Grimes field.

Occidental's 1 Arbini, in Sec. 13-1n-7e of the East Stockton area, will go down about 9,000 ft.

Two Firms Join Alaska Hunt

TWO COMPANIES have acquired half interest in Richfield Oil Corp.'s exploration activities in the Katalla-Yatataga area of the Gulf of Alaska.

They are Sinclair Oil & Gas Co. and BP Exploration Co. (Alaska). Each holds 25% interest in the operation, which involves 1,060,000 acres covered in two development contracts.

Richfield is drilling below 11,000 ft. in its second wildcat on the acreage.

The test, 2 Kaliakh, originally was drilled to 9,575 ft., plugged to 4,795 ft., then whipstocked to the present depth.

The second well is 2 miles north of the 1 Kaliakh, which was suspended at 14,699 ft. Protective casing was set in the first hole, indicating the company may re-enter the well.

Richfield discovered Alaska's Swanson River field in 1958.

INDUSTRY BRIEFS . . .

A unit and pressure-maintenance program aimed at recovering an estimated 5,500,000 bbl. of additional oil from two zones in Red Fish Bay field, Texas, is planned by Sunray Mid-Continent. The pressure-maintenance program calls for water injection into the 5-A and 5-B pay zones at 7,880 ft. and 7,925 ft., respectively, if the Texas Railroad Commission approves.

A San Andres flood project in which Cities Service expects to add about 3,000,000 bbl. of oil to total recovery from its Cummins "C" and "D" leases in Goldsmith field, Ector County, Texas, has been approved by the Texas Railroad Commission. Original oil in place in the 4,200-ft. San Andres was fixed at 9,300,000 bbl. Cities Service estimates the flood area is 83.3% depleted by primary means.

Sale of Felmont Oil's domestic and Canadian producing leaseholds to Cities Service Petroleum has been approved by shareholders of the parent firm, Felmont Petroleum. The $14,800,000 sale did not include holdings in the Gulf of Mexico and the Appalachian basin area.

In an oil-gas swap, Belco Petroleum has assigned 52.5% of its interest in Sublette County, Wyoming, oil leases to Pan American Petroleum, a subsidiary of Indiana Standard. Pan American has assigned to Belco its natural-gas reserves in the same area, the Green River basin of southwestern Wyoming.

A 300,000-bbl. products terminal is being built at Vancouver, Wash., by Golden Eagle Refining, Los Angeles, as a wholesale products outlet. A barge terminal is planned in the Seattle-Tacoma area. Golden Eagle sold its retail outlets and brand name in Washington and Oregon to Westway Petroleum, a Union Oil subsidiary, 2 years ago. Golden Eagle has no plans to re-enter the retail field in the two states.

Will Canadian Crude Move Into Houston

CONTACT men are approaching producers of Canadian oil with a spectacular plan:

Sell crude to an unidentified buyer at a cut price for shipment into the Houston area. The target: More than 100,000 bbl. daily. The plan, which most majors think impossible or, at best, improbable, is shrouded in secrecy.

The crude would be purchased in Alberta or British Columbia and moved through Trans Mountain Pipeline to Anacortes, Wash. It would thus enter the United States free of quota restrictions because of the exemption for overland imports from Canada and Mexico.

From Anacortes the crude would be shipped by tanker through the Panama Canal to Houston or other Gulf ports.

Most industry men who have heard of the scheme — including several who have been approached to participate in it—scoff at the whole idea as naive and impractical. They say that:

. . . **There is not** that much crude of the requested specifications obtainable in Canada at the moment.

. . . **Producers** would not accept the offered price.

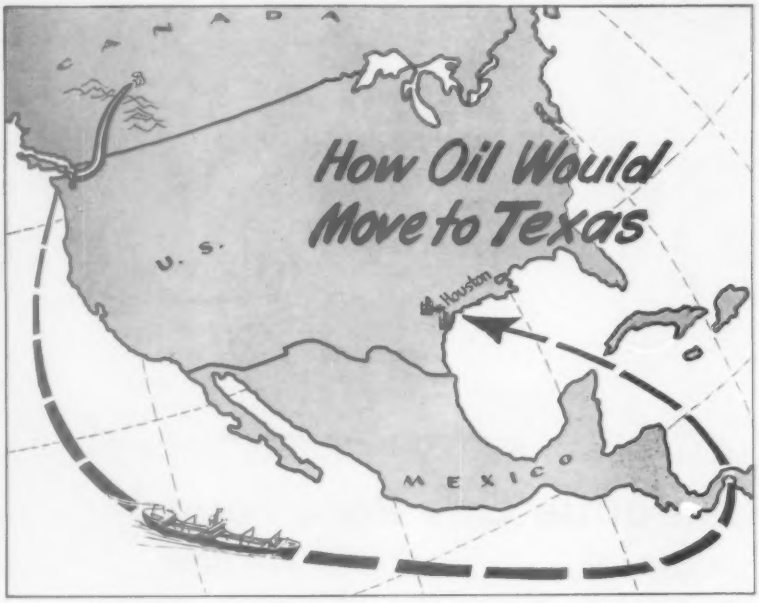
. . . **Tanker rates** could not be beaten down enough.

. . . **In any event,** the governments of both countries would interpose some obstacles because it would lower the posted price of crude on both sides of the border.

Some conditions . . . Success depends on a reduction of something like 65 to 75 cents per barrel in the Alberta wellhead price and a tanker rate of around 50 or 60 cents per barrel, compared with current quotations of 80 cents to $1.00

Contracts of 5-year duration and the prospect that the movement may be increased to 200,000 bbl. per day within a year are being suggested as inducements for these low prices.

Success also depends on at least the tacit approval of the governments concerned, since the movement would be within the letter of the Canadian exemption but could be viewed as a violation of its intent.



Exploratory inquiries for the deal are being made, in a somewhat round-about fashion, by a number of intermediaries, brokers, and attorneys, each ostensibly working independently on a single part of the project.

Because of the guarded way in which relatively unknown agents have been making inquiries, the presumption is that whoever is behind the scheme is taking elaborate steps to conceal his identity until after the crude movement gets well under way.

Not unprofitable . . . Politics and economics appear to favor the project—at the moment.

Some oil men not involved have concluded from rough calculations that the deal would be profitable if a good tanker rate were obtained, if Alberta's proration policies could be bent to permit it, and if producers were willing to take a cut of at least 65 cents a barrel below posted prices.

The negotiators are inquiring for low-sulfur crude averaging not over 32° or 34° gravity.

Alberta's production is heavily prorated, and there is ample shut-in capacity to produce an additional 100,000 bbl. per day. However, it is a question whether enough producers would accept a big discount even for a 5-year contract. Some Alberta producers have flatly refused to discuss the proposition.

The movement . . . The Trans Mountain line, from Edmonton to Puget Sound, has idle capacity to handle this additional movement.

Also, within the past 2 weeks the

Canadian Plans

THE UNITED STATES holds the key to Canada's new national oil policy.

If Canada is to reach its production goal of 800,000 bbl. daily, exports to the U. S. must more than double in the next 3 years.

And whether U. S. officials will consider an increase of this size reasonable is the question on which Canada's oil policy hinges.

At present, these exports average 113,000 bbl. daily. They would have to jump to 230,000 bbl. daily to make the plan work.

The new policy, enunciated by Trade Minister George Hees before the House of Commons (OGJ, Feb. 6, p. 88), gives the Canadian industry a pretty tough assignment.

In brief, it sets production targets for crude oil and natural-gas liquids at 625,000 bbl. daily by mid-1961,

n Big Volume?

British Columbia government has issued a permit to Westcoast Transmission Co. to build a crude line from Fort St. John to Kamloops, to connect with Trans Mountain. The line will be built this year, with initial capacity of 12,000 bbl. per day and ultimate capacity of 75,000 bbl. per day.

At Fort St. John the new Westcoast crude line will be fed by the Trans Prairie Pipeline, currently under construction from Boundary Lake and other fields to the north.

The water portion of the haul, being classified as domestic, would require vessels of American registry, and charter rates for these have been rising recently. Some observers have estimated that supertankers—just small enough to get through the Panama Canal—might handle this volume at the rate being mentioned.

The economics . . . The economic assumptions work out something like this: Wellhead price of $1.70, 10 cents gathering charge to Edmonton, 42 cents pipeline tariff to Anacortes, 10.5 cents U. S. customs duty, 6 cents loading and miscellaneous charges, and 60 cents tanker rate to Houston would deliver Canadian crude to Texas refineries at $2.95 per barrel.

Texas crudes of comparable grades deliver in Houston at from $2.97 to $3.11 per barrel.

Who's behind it? . . . For the past couple of years a number of Alberta producers have been advocating a government-financed crude pipeline to the Montreal refining area so that prairie province crude could displace imports.

Such a line would be a heavy blow to Venezuelan producers marketing in eastern Canada.

It is this which directs some industry speculation toward a few international companies as the possible principals behind the negotiations to bring Alberta crude to Texas, the reasoning being that a new market of this size would relieve political pressure for the Montreal line and thus preserve the Canadian outlet for Venezuelan crude.

On the other hand, the instigation could very well be coming from some southeastern marketer seeking new supply sources—or independent agents hoping to deal with such a company—who could easily arrange to have the Canadian crude processed at independent refineries on the Gulf Coast.

Unrealistic? . . . It is a confirmed fact that certain agents are making inquiries looking toward the proposed movement of crude into Texas ports. But most oil men who have learned of the plan are convinced that it is unrealistic and will never be consummated.

They point out that the Alberta proration system could be applied in such a way as to prevent sale of a large volume of crude at a big discount. Sale of 100,000 to 200,000 bbl. per day at cut prices would quite likely bring down all Canadian postings, and it is assumed that provincial authorities might prevent this even if the dominion government did not frown on discount sales.

Furthermore, such imports into the Gulf Coast would cut into the demand for Texas crude and could bring down postings in that area.

Whether or not the Alberta-to-Texas movement develops, it is obvious that there will continue to be pressure for increased shipment of Canadian oil into the United States. The current project, bizarre though it may seem, is a symptom of prevailing conditions in the North American oil market.

or a Bigger Oil Market Are Tied to U. S. Policy

640,000 bbl. daily average for all of 1961, and 800,000 bbl. daily in 1963.

Like the previous goal of 700,000 bbl. daily by the end of 1960, the new aims will be hard to achieve. Canada fell short of the 1960 goal, reaching a production of only 550,000 bbl.

This time the government is talking tougher.

The expressed alternative to the new "voluntary" program is imports control. And, the government implies, with control would go the independent-backed Alberta-Montreal crude line aimed at forcing Canadian crude into Montreal and forcing foreign crude out.

Hees says industry can meet production goals:

". . . **By increased use** of Canadian oil in domestic markets west of the Ottawa Valley (in Ontario)."

". . . **By some expansion** of export sales, largely in existing markets which can be reached through established pipelines."

The minister called for replacement of the 51,000 bbl. daily of Montreal-refined products now moving west of the Ottawa Valley with products refined from Canadian crude in Ontario.

He issued a virtual ultimatum for an end to the 5,000 bbl. daily of crude imports coming into Ontario. And he proposed a progressive reduction of the 22,000 bbl. daily of middle distillates and heavy fuel being imported into Ontario from outside the country.

To make up the deficit, Ontario refining capacity must be expanded an estimated 70,000 bbl. daily by 1963.

Getting the increase . . . Here are the factors that could bring about 800,000-bbl. daily production for Canada:

. . . **Domestic demand** for Canadian crude and natural-gas liquids (429,000 bbl. daily in 1960) should increase 4% per year to near 500,000 bbl. daily in 1963.

. . . **A 70,000-bbl.** increase in Canadian oil's share of the Ontario market will raise demand to 570,000 bbl. daily.

This would be all that Canada could take in the way of additional production. The remainder of the increase will have to be gained by a step-up in exports, and the U. S. is the only export outlet.

Where exports will go . . . Exports are confined to two U. S. areas—the Puget Sound of Washington,

which took 50,000 bbl. daily last year, and the Midwest, which took 63,000 bbl. daily.

Both areas are reached by trunk pipelines from Edmonton—Washington by Trans Mountain Oil Pipe Line Co.; Minnesota, Wisconsin, and Michigan by Interprovincial Pipe Line Co.

There is some prospect for expanding these markets, but nothing like the 117,000 bbl. daily that Canada hopes for by 1963. Canadian crude has just found three new customers in the Detroit - Toledo area, Mobil Oil Co., Gulf Oil Corp., and Standard Oil Co. (Ohio) which are buying about 17,000 bbl. daily.

However, Canadian producers believe they will have to crack an entirely new market to achieve the big export expansion that is proposed.

Buffalo is one possibility that is mentioned. The other—and the one on which most Canadian hopes are based—is Chicago, the largest single market available to Canada.

One proposal to serve the Chicago market calls for a 16-in. pipeline to deliver 50,000 bbl. daily of natural-gas liquids from Alberta. This idea now becomes politically more attractive in Alberta. Standard Oil Co. (Ind.), one of the line's backers, is offering to buy all surplus liquids in the province.

The Alberta Oil and Conservation Board began hearings last week on the last of several competing proposals to dispose of the liquids. Large volumes will become available late this year from plants built to process gas for a 36-in. line to California.

If policy fails . . . The voluntary approach of the government was generally applauded by the Canadian industry, with differing qualifications as to approaches in the event goals aren't met.

Non-importers among the independents generally said "it's about time" definite steps were taken to expand markets.

Importers and other majors feel the government should be realistic when it checks on progress. They say the effects of booming natural-gas sales on oil demand should be taken into consideration, and that allowances should be made for a lagging economy.

Fate of Canadian imports . . . The 1960 level of imports at 94,000 bbl. daily (middle distillates 38,000, heavy fuel 35,000, motor gasoline 3,000, and "other" 18,000) is expected to decline gradually.

However, over half of this volume comes into Quebec and the Maritimes, and thus will be unaffected by the new policy.

Crude imports in 1960 averaged 347,000 bbl. daily. Except for the small volume entering Ontario (about 5,000 bbl. daily), imported crude will continue to flow into eastern Canada at about the same daily level—including 199,000 bbl. from Venezuela, 140,000 bbl. from the Middle East, and 8,000 bbl. from the U. S. and Trinidad.

Importers believe they can reduce product transfers from Montreal into Ontario west of Ottawa without cutting crude imports in 1961 and 1962. In 1963 a slight dip is expected, followed by an increase in 1964. Thereafter crude imports will depend on growth of the eastern market outlined for them.

The level of product imports west of Ottawa will depend on the ability of Ontario refiners to meet fuel-oil requirements with operating rates geared largely to gasoline demand. Certain specialties will continue to be imported.

California Lease Sale Flops

- Tract off Santa Barbara County goes begging, but real test of tidelands popularity won't come until March.

WEST COAST oil companies turned their backs on California's latest offshore lease sale—the first since July 1958—by refusing to submit a single bid.

Only one block was up for bidding—a 4,250-acre tract off Santa Barbara County. The tract, known as Parcel 1, is adjacent to a block now being developed by a group headed by Phillips Petroleum Co.

When the 11 a.m. deadline arrived February 3, there were no bids offered to Parcel 1.

However, the failure of this lone tract to draw a bid doesn't mean the companies aren't interested in offshore California.

A true reflection of how the companies feel about the state's tidelands will come March 3 when bids are announced on a nearby tract, Parcel 2. This 4,250-acre parcel is adjacent to the Phillips lease and only 2 miles west of Parcel D, which is being developed by Texaco Inc. and two partners. Parcel D brought $23,711,538 in 1958.

Parcel 2 also is included in the acreage nominated by Shell Oil Co., but Parcel 1 is not.

The acreage snubbed by the companies is near the Pacific Missile Range, which the Navy is trying to expand, and is crossed by shipping lanes which might present problems in locating a platform.

"Don't Try to Develop Your Own Oil"

• That's the advice of Walter Levy to developing nations in the first study of its kind made for an international agency. Private industry—and capital—does better, he says.

Walter J. Levy

AUTHOR of the study is an internationally respected consultant.

His career spans many assignments for private oil companies, the U. S. Government, and several foreign countries.

A native of Hamburg, Germany, the 49-year-old Levy has lived in the U. S. since 1941, when he joined the Office of Strategic Services.

After the war he spent 3 years in the State Department as an adviser on petroleum matters.

During 1948 Levy was economic adviser for Socony Mobil Oil Co. and later had charge of petroleum economic operations for the Economic Cooperation Administration. He became an independent consultant in New York in 1949.

Levy has acted as part-time consultant to various government agencies since then.

Among nations which have employed him as a consultant are India, Libya, and Trinidad.

THE BEST COURSE for a nation seeking to develop its potential oil resources is to encourage private financial and technical assistance from outside its borders.

That conclusion is clearly evident in a special study and report made by Walter J. Levy, a New York oil consultant, for the U. S. International Bank for Reconstruction and Development.

The report, "The Search for Oil in Developing Countries," is being distributed by IBRD to selected governments abroad and to a few international oil companies.

The study focuses on the basic question of whether a government can handle exploratory operations and development better than private enterprise.

Levy carefully steers clear of the social and political aspects. He makes it plain he feels a nation has a right to choose its own approach. Nowhere does he criticize government oil operations.

"It is not the success or failure of a state enterprise that is most significant," he says. "Far more fundamental is the question of policy—which course holds the greatest promise for national oil development."

The study is divided into three major parts: The problems inherent in a search for oil, a study of government oil monopolies, and a study of states where private participation supplements state operations.

1. Problems

Levy emphasizes that the biggest problem in this risky business is money: Money to find the oil and money to develop and utilize the oil once it is found.

He concedes that a government may supply the necessary funds, but he points out some drawbacks to this approach.

In a state enterprise, choices and decisions reflect one centralized judgment—the government's. But if private companies are in the field, with each exercising its own judgment, there are as many choices and decisions as there are companies.

Thus, should one company decide a search was useless, another might keep on trying.

Also, according to Levy, decisions of a state enterprise are always susceptible to politics. A government agency, for instance, would have to justify large expenditures on dry holes.

Capital costs, too, can be a great drain on a developing country and its foreign-exchange balance. In an oil search, this drain can be a long one before oil is even found.

Levy cites Guatemala, where 30 firms spent $20 million in 1957-58 before extensive drilling began. These outlays were more than 10% of the government's income.

"It is clear that the state on its own could hardly mount an exploration program of comparable proportions," Levy says.

He warns, too, of the continuing cash drain even after reserves have been discovered.

Levy's conclusion:

"For most countries, especially those in the process of economic development, the financial requirements would strain financial resources to the utmost.

"If undertaken by government, it must be at the expense of other critical projects."

Realizing the attraction of an oil hunt, Levy makes this observation:

"The promise of exploration can be a siren's lure."

2. Government monopolies

In general Levy finds that where a government oil monopoly exists, exploration and development usually get the short end of the stick.

The reason is understandable: A government oil monopoly can show quicker results and quicker "profits" from its investments in refining than it can show from the slower, riskier search for oil.

Levy notes that in Brazil, Petrobras has built up refining capacity at a rapid rate but its exploration effort has been limited.

"This is not a criticism," Levy says, "but it's true that this generally happens and that the discovery of a nation's oil potential suffers as a result."

Government monopolies also face the problem of how to price their products.

If the price is set low to make the energy resource available to more people, this tends to slow the regeneration of funds for exploration.

If the price is high, it puts a burden on the domestic economy, saddling the oil users with the high costs of the initial exploration and development.

3. Private participation

Many countries have encouraged private capital.

This, says Levy, reflects a desire to step up local oil development beyond what could reasonably be expected of a government oil entity itself.

He concedes that the question of foreign investment may pose ideological or political issues in some countries.

"But it is significant that many countries have arrived at a form of operation for such private participation and are convinced that they have not thereby compromised either their national or social objectives," Levy points out.

How to do it . . . Levy stresses that effective cooperation between government and industry depends on arrangements that help the interests of both.

He lists these prerequisites for industry:

. . . **Foreknowledge** of a company's obligations and rights.

. . . **Expectation** of favorable returns if the venture succeeds.

In turn, under such arrangements, the government can expect to benefit in several ways from its cooperation with private enterprise.

. . . **Risks of failure,** inherent in exploration, are borne by private enterprise rather than by the government.

. . . **Essential capital** becomes available.

. . . **Foreign-exchange** requirements are lessened.

. . . **Experience, methods,** and equipment are brought into a nation's oil program. And diversification of judgment provides a greater promise of success.

Levy puts greatest stress of all on the tremendous initial cost and uncertainty in an oil search.

Some examples he cites:

. . . **In Ecuador,** two major firms searched from 1938 to 1950 without success, spending $47 million.

. . . **In Peru,** 12 companies got exploration rights under the 1952 petroleum law. Between 1953 and 1956, 22 wells were drilled at a cost of $20 million, but there was no commercial production.

. . . **In Denmark,** a company drilled six dry holes and spent almost $10 million unsuccessfully. Yet, in 1957, another company began a $5-million drilling program.

The question Levy implies: Would a government dare take such risks?

To demonstrate the scale of investments required, Levy notes that at the end of 1955 the net investment in property, plant and equipment of the petroleum industry outside the United States and the Soviet bloc was around $12.8 billion.

By the end of 1958, he reports, this had risen to $22.6 billion.

4. Monopoly studies

Levy winds up his report with a detailed study of oil monopolies in Brazil and Mexico.

He obviously does not think the operation of Petrobras has been very successful.

"One must certainly take account of the difficulties it faced in the first 5 years of operations," he explains.

"Nevertheless, set against the expanding dimensions of Brazil's oil economy, the results would probably have to be counted as disappointing."

Levy notes that Mexico's Pemex was forced to reorganize in 1958 because "it was clear a financial crisis was inevitable in view of Pemex's long history of inadequate profits and capital strength.

"The big question is whether Pemex can accomplish in the future what could not be done in the past—namely, generate earnings to provide an adequate return of the public and private capital that is being so heavily committed."

Levy compares the records of Brazil and Mexico with the results being obtained in countries that are turning to cooperation between the state and private enterprise.

"By contrast to Brazil and Mexico, nearly every other country that has state oil operations has found it advantageous to accept the participation of private enterprise under arrangements that are compatible with its own national oil policies," Levy reports.

In 1959, the Argentine Government turned to private industry to supplement state effort.

"A program of oil exploration and development has been launched that holds forth promise of early self-sufficiency for Argentina," Levy says.

Bolivia experienced slow development under its government program. Then, in 1952, the government began moving in the direction of a more liberal policy for oil companies "as the only practical means of a more rapid oil development."

In 1955, the Bolivian Government adopted a new petroleum code.

"It is still too early to predict results, but the activities now taking place allow a much more extensive testing of prospects than Yacimientos Petroleo Bolivia Fiscales could have ever handled by itself," Levy says.

In India: "If private investment can be brought into exploration to supplement Indian Oil and Natural Gas Commission operations, India can hopefully look forward to a much larger effort toward closing the oil gap than it could ever muster itself."

New Japanese Petrochemical Complex Planned

• Two recently completed Kawasaki refineries will provide feedstocks.

TWO NEW refineries will serve as major sources of feedstocks for a blossoming petrochemical industry at Kawasaki, Japan.

Both plants are partly owned by Toa Nenryo Kogyo K.K., which in turn is owned 55% by Stanvac.

The refineries will be part of a petrochemical complex planned by a newly established subsidiary, Toa Nenryo Petrochemical Co., Ltd. The government has given the company permission to build a $25-million project by early 1962.

The larger, 35,000-bbl. refinery is owned by General Oil Co., owned 50-50 by Toa Nenryo and General Bussan K.K. Facilities include a 35,000-bbl. desalter of the Petreco type, a 5,400-bbl. Morox gasoline-treating unit of UOP design, and a 3,000-bbl. Petreco Electrofiner kerosine-treating unit.

All tank gaging is remote controlled and recorded, and instruments are operated electrically, rather than pneumatically. Tetraethyl lead and fuel oils are line blended.

A Platformer and a gas-oil hydrodesulfurizer are being added.

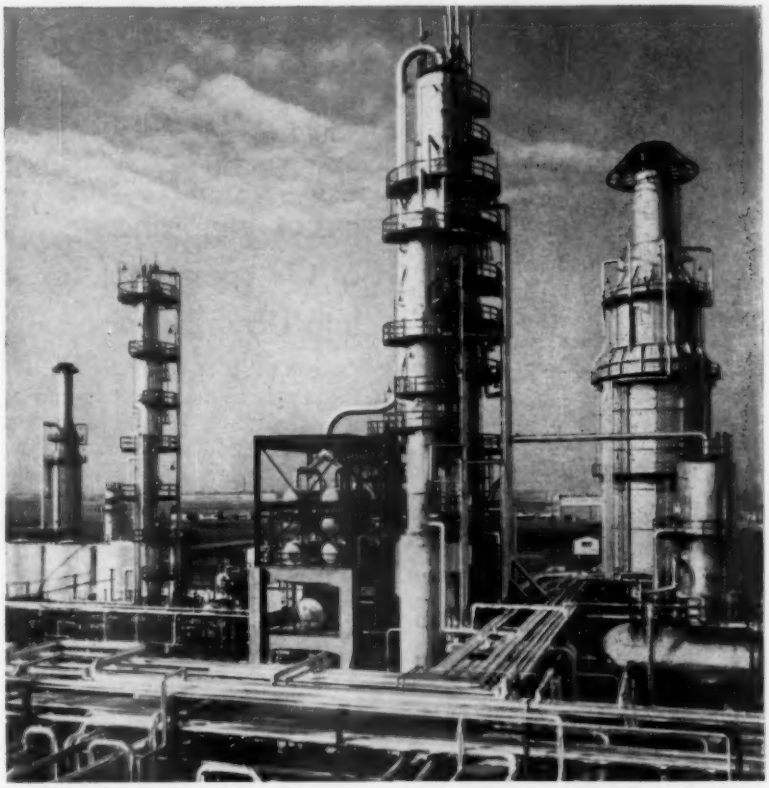
A smaller, 17,000-bbl. refinery is being operated in the same area by Nichimo Sekiyu Seisei (Petroleum Refining) K.K., owned 60% by Toa Nenryo.

An LPG plant is under construction in the area by General Gas Co., owned 25% by Stanvac, and 30% by General Bussan. The plant will handle imports of refrigerated LPG from the Middle East. First shipments are scheduled to arrive near the end of 1961.

The related petrochemical facilities will include plants to produce ethylene by steam cracking, and octanol using the Aldox process.

The company expects to produce 40,000-tons-per-year of ethylene from a unit of 60,000 tons capacity, and 6,000 tons of octanol from a 10,000-ton unit.

Existing facilities . . . Toa Nenryo facilities will form the second petrochemical complex at Kawasaki. Nippon Petrochemical produces 25,000 tons per year of ethylene, and will step up output to 40,000 tons by the end of the year.



NEW REFINERY of General Oil Co. is the larger of two new plants near Kawasaki which will help boost Japanese petrochemical output.

Other companies with facilities nearby include Nippon Petroleum Refining, Furukawa Chemical, Japan Catalyst Chemical, Japan Geon, and Asahi-Dow.

Companies which may in part be supplied by the new Toa Nenryo units include: Nitto-Unicar, owned 50-50 by Nitto Chemical and Union Carbide, which will need ethylene to produce polyethylene, and Nitto Chemical, which needs propylene to produce acrylonitrile. Japan Geon, 35% owned by B. F. Goodrich, buys butadiene for synthetic rubber production. Asahi-Dow buys ethylene to produce polyethylene.

Other chemical companies in the area are Showa Denko, Showa Petrochemical, and Kureha Chemical.

Mitsui Chemical and Ethyl Corp. are planning a joint company in the area for the production of tetraethyl lead for the first time in Japan. An estimated output of 6,500 tons per year will offset Japan's current import requirement.

When Toa Nenryo's project is in full-scale operation, Kawasaki will compete with Japan's three other major petrochemical centers. These are facilities of Mitsubishi at Yokkaichi, Sumitomo at Niihama, and Mitsui and Iwakuni.

Papuan Oil Hunt Revamped

A LOCAL Australian company will take over control of exploration in Papua.

The company, Oil Search, has reached an agreement with British Petroleum and Stanvac, under which it will increase its holdings from 15 to 80% in two companies holding exploration licenses. These are Australasian Petroleum Co. Pty., Ltd., and Island Exploration Co. Pty., Ltd.

Oil Search will become operator.

Iranian Gas Field Shows Oil

OIL SHOWS have been found for the first time in Iran's Pazanun gas field.

A new well drilled by Iranian Oil Exploration & Producing Co., the operating company for the consortium group, entered the productive Asmari limestone at 9,080 ft. Deepening of the well, No. 5A, and possibly the drilling of another nearby test, will be required to determine whether the oil find is commercial.

Pazanun field lies on the pipeline route from Gach Saran oil field to Bandar Mashur. The field lies a few miles southeast of the prolific Agha Jari field, and is on almost the same northwest-southeast line. Agha Jari is the source of most Iranian crude production, averaging around 650,000 bbl. daily from 33 wells.

The 5A is the second well drilled at Pazanun in search of oil. The No. 5 was discontinued for mechanical reasons.

The company also is making preparations for a wildcat on Shaikh Shuaib Island, on the Straits of Hormuz. The island lies a few miles offshore, near the southern end of the Persian Gulf, but is included in the consortium's exploration area.

The new wildcat, Lavan 1, will be started after completion of Suru 1, an exploratory well at Bandar Abbas, and a test at Bibi Hakimeh, about 30 miles south of Gach Saran. Seru 1 is at 14,895 ft., a record depth for Iran.

Easier Importing of Oil Equipment Into Libya Seen

IMPORTS of oil equipment into Libya may be made easier by a new set of customs regulations.

The government has issued a revised list of 18 categories of duty-free materials, covering almost every piece of equipment needed for oil exploration and production.

The list also looks to the future by providing for duty-free importation of refinery equipment.

The regulations may lessen the dock-side bickering that sometimes takes place between company representatives and customs officials.

In the past, trucks have been delayed at Tripoli because inspectors believed duty should be paid on tires. They argued that tires were available locally. As a result, some trucks were brought into the country without tires.

Questions like this still may occur. The exemptions exclude any equipment which is rivalled by local products. Duty and other expenses also may be added to imports in making price comparisons with local products.

But there is no doubt that the whole gamut of oil equipment is covered by the list.

Naples Chemical Plant Set

A MAJOR basic-chemicals plant will be built at Naples by a newly formed affiliate of Socony Mobil.

Paul V. Keyser, Jr., president of Mobil Chemical, said that Mobil Chimica Italiana S.p.A. will produce 130,000 metric tons, or 39 million gallons, per year of benzene, ethylbenzene, orthoxylene, and paraxylene. More than 75% of the output will be benzene and orthoxylene.

The plant will take most of its feedstocks from the adjacent 113,700-bbl. Mobil Oil Italiana refinery, largest in Italy.

The construction project is the first in Europe for Mobil Chemical, formed in mid-1960. The company has ethylene and benzene plants under way at Beaumont, Tex.

FOREIGN BRIEFS . . .

Drilling program for Kuwait Oil Co. this year calls for continuous operation of five to six rigs. An $8.5 million program will include 30 wells in Burgan field, three in Minagish, and six in the Raudhatain-Sabriya area.

Japanese tankers will be swapped for Russian crude this year as part of an $80-million trade agreement. In exchange for oil and other raw materials, four 25,000-ton tankers will be built in Japan for Russia, along with three 12,000-ton diesel motor ships, floating cranes, and other heavy gear.

A **regional meeting** of the Saudi Arabia section, Society of Petroleum Engineers of AIME, will be held in Dhahran, Saudi Arabia, March 27-29. Technical papers will be discussed and facilities of Aramco will be inspected by the members.

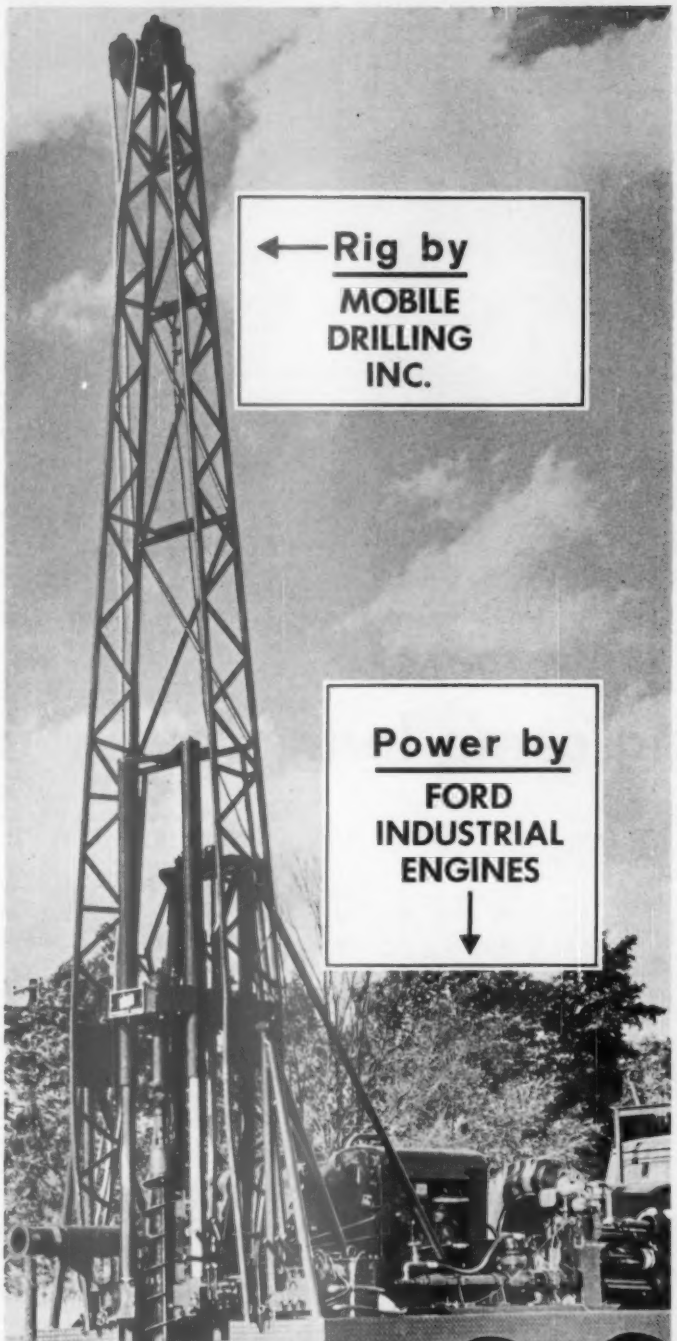
Abandonment of the latest Nigerian wildcat drilled by Mobil International marks the company's third dry hole in the country. The wildcat, Bodashe 1, was abandoned at 4,954 ft.

An offshore wildcat in the Gulf of Suez will be started in a few weeks off the Sinai Peninsula at Belayim Bay. Cie. Orientale des Petroles d'Egypte, which produces about 30,000 bbl. daily from Abu Redeis and Belayim onshore fields in the area, is owned by Egypt and International Egyptian, which is controlled by ENI and Petrofina.

Noncommercial quantities of oil have been found by Sinclair Somal Corp. in a Somalia wildcat. The company had the show in Cariole 1, about 50 miles west of Mogadiscio and 30 miles inland from the Indian Ocean. The well is now being deepened, and additional tests may be made. Depth of the show was not disclosed.

Pemex plans to complete more than two wells per day this year. Most of the drilling will take place in old field areas along Mexico's Gulf Coast, where deeper pays—below 10,000 ft.—are the source of most of the country's new production.

A **cold winter** has helped push Venezuelan crude production to the highest level in 2 years. Output has averaged more than 3,000,000 bbl. daily since the start of the year.



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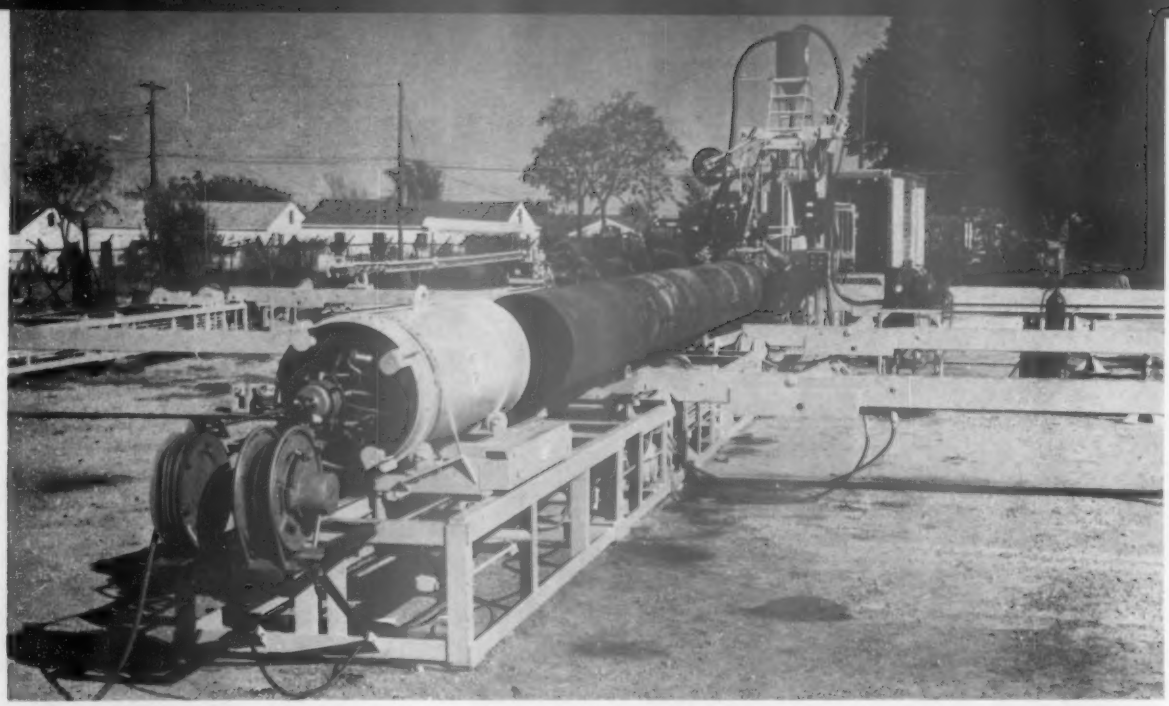


OVER-ALL VIEW of Crose-Price-O-Matic plant. Self-propelling lineup clamp in foreground, automatic submerged-arc welding head beyond.

Double-jointing came long way in '60

EQUIPMENT CHANGES in large portable field plants using automatic welding for double jointing are greatly increasing their effectiveness.

Advantages of the newer basic designs for fullest use of automatic welding were demonstrated in 1960 when 750 miles of double-jointed pipe was used on the Transwestern system and lesser amounts on other large projects.

In 1961 double jointing promises to be still more important because it has been specified for the 1,400-mile trunk line to transmit gas from Alberta to San Francisco for Pacific Gas & Electric Co.

Three Types

Three different types of double-jointing plants are being used on this big project.

Both the Crose-Price-O-Matic and the Stanley-Bledsoe double-jointing units follow procedures pioneered in automatic-welding field operations early in 1957 by H. C. Price on the Trans-Canada project. (OGJ, April 22, 1957, p. 104). In 1957 an affiliate of the F. E. Stanley and C. C. Bledsoe interests had a fully automatic welding plant at

BY PAUL REED
Pipeline Editor

Gadsden, Ala. Procedures used at both types of plants consist of:

1. Using a thicker land and butting the pipe directly together.
2. Welding by submerged-arc automatic welding with three beads—two run first on the outside followed by an inside bead.

A modified form of this technique is seen in the Bechtel-Perrault machine designed for welding with a "dog-leg compensator" for supporting the pipe during rotation and with a backup shoe covered with a glass belt for running all three beads from the outside.

Two-Rack Type

Basic features of the Crose-Price units are:

1. Welding on two separate racks—one for the two outside beads and the other for the inside bead.
2. Welding by completely automatic submerged-arc welding heads.
3. Welding speed, approximately 90 in. per minute.
4. The inside welder goes in and out of the pipe on a gantry boom.

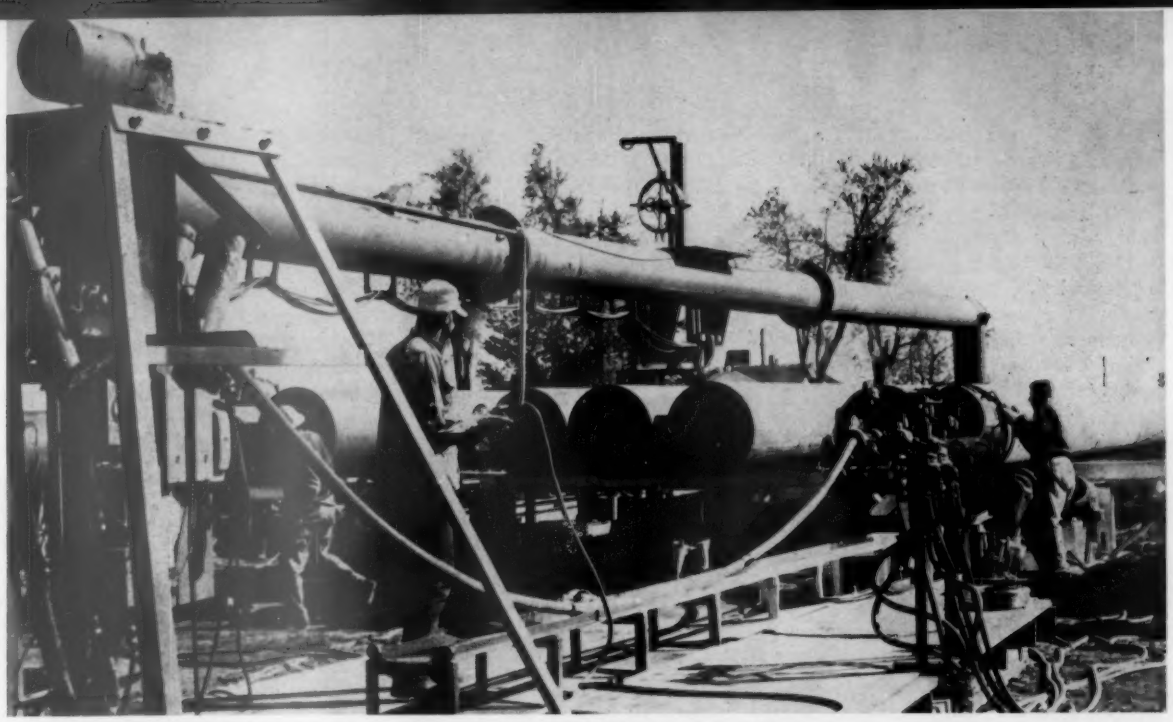
(OGJ, December 16, 1957, p. 82).

A recent improvement eliminates the 3-in. manual tack weld formerly made before running the first bead on the outside of the pipe. The improved procedure consists of leaving a gap of ⅛ to ⅜ in. between pipe ends at the bottom, while pipe ends at the top are butted directly together.

After the initial submerged-arc weld has been run for 8 in., the gap at the bottom is closed by upward pressure by an extra set of turning rolls floating on a spring. Another roll pushes laterally against the pipe so as to insure a tight seam at the electrode.

After running the initial bead 180°, the floating roll is dropped and the pusher roll remains engaged until the two outside welds are completed.

Air clamp added. Lineup operations have been accelerated by the self-propelling air clamp added recently. This supplants the manually pushed and pulled mechanical clamp. Operation and movement of the clamp are handled by push-button control manipulated by the spacer at his station near the weld-



INTERNAL AUTOMATIC welding head entering 30-in. pipe at Stanley-Bledsoe double-jointing plant.

. . . and greater progress foreseen for '61

ing position. The self-propelling feature of the clamp makes it possible to eliminate the need for one or two clamp men.

Changes in the pipe-handling equipment facilitate handling pup joints as short as 16 ft.

To aid in breaking down one of these double-jointing plants for transportation to the next site, the external pipe-handling racks for the latest units are provided with two complete hydraulic systems. Consequently it is not necessary to disconnect hydraulic lines when dismantling. And clogging of lines with foreign matter is avoided.

Other difficulties with hydraulic lines have been eliminated by changing to roller equipment for doing pipe-handling work at the racks formerly done by small cars running on a track.

Safer operations. Recent safety devices now safeguard the man inside the pipe. When he goes into the pipe, the boom carries him the full extent of travel without possibility of interruption. In coming out, he must proceed without stopping after he gets to within 10 ft. of the end of the pipe.

While the operator is working inside the pipe, the whole outside control system is locked out so that it is dead. These safety measures were taken even though there have been no accidents to men in the pipe.

To complete an outside weld on 30-in. pipe with two beads takes 3½ minutes; for 36-in. pipe about 5 minutes. The inside bead is next made at a nearby rack at about the speed of electrode travel. Electrode travel speed is 85 to 90 in. per minute; this could be speeded up to 120 in. per minute.

Voltage, amperage, offset, and timing specifications are changed within limits of 10 to 20% to meet different conditions. A representative specification is: 33-volt, 850-amp., 2¾-in. offset, and 5/32-in. wire plus appropriate timing.

The unit now used by Dutton-Williams Brothers can handle pipe from 22 to 42 in. in diameter. First deliveries of pipe, from a Canadian pipe mill, providing special beveling for double jointing are going to the operations of Dutton-Williams Brothers in Alberta on the project for the movement of gas to PG&E. The 36-in. pipe has 0.402-in. wall; 30-in. has 0.359-in. wall.

At one end, for the Crose-Price submerged-arc technique, the pipe is beveled with a land having a thickness of not more than 5/16 in. and not less than 3/16 in. Thus, need for grinding down normal bevels at the field double-jointing plant is eliminated. And squarer joint ends result from joint preparation at the pipe mill. The other end of the pipe has a standard bevel of 30° with a 1/16-in. land of the kind regularly provided for manual electric-arc welding.

Another recent example of pipe being mill beveled especially for double jointing is that of the pipe being furnished to H. C. Price in California on the PG&E project. This pipe has a thicker land and a chamfer amounting to only 1/16 in. of the wall thickness—little more than a nick.

Mill beveling eliminates a cost item at the field plant and brings benefits from greater accuracy expected from big manufacturing operations.

Cost per Weld

Total costs of welding 36-in.-diameter, 0.344-in.-wall pipe with the new Crose-Price units are esti-

mated at $25 to $30 per weld. Such units can make 910 welds per 70-hour week (130 welds per day), slightly less than 5 minutes per weld. These plant units cost from $155,000 to $165,000 each depending upon the customers' requirements.

Estimated cost per weld is broken down as follows for a representative operation:

Cost Per Weld

Labor payroll	$ 9.50
Insurance, taxes, etc.	1.90
Rental machinery (automotive)	1.50
Materials (flux, electrodes, and grinding stones)	1.27
Gas, oil, maintenance, parts etc.	1.30
Internal-lineup clamp	1.50
Double-point unit	10.00
	$26.97

Total welding cost of a mile of double-jointed pipe, including cost of both automatic and submerged-arc welding, can be estimated in two ways: One assumes a cost of $36.00 per weld for manual welding at the familiar rule-of-thumb estimate of $1.00 per diameter inch. The other assumes a flat $30.00 per weld for manual welds. Automatic welding is figured at $27.00 per weld. For a mile of pipe it is assumed that there will be 66 automatic welds and 66 manual welds for laying 80-ft. joints.

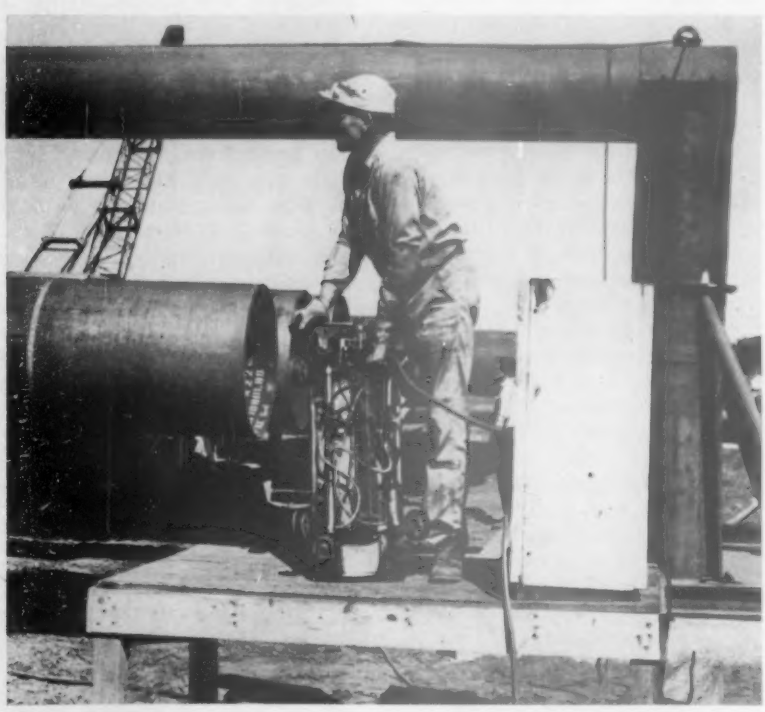
Welding Costs

	Cost/weld	Cost/mile
Automatic welds	27.00	$1,782.00
Manual welds	36.00	2,376.00
Total		$4,158.00
Automatic welds	27.00	$1,782.00
Manual welds	30.00	1,980.00
Total		$3,762.00

Cost comparisons based on these estimates point to possible reduction of total welding costs of $200 to $600 per mile of double-jointed pipe.

Such savings in welding cost by double jointing are regarded as worth considering even though the margin is close. These savings are somewhat offset by additional costs of moving pipe into and out of automatic welding plant yards. In turn, these are offset by savings in stringing costs because more stringing footage per truck per day is possible with 80-ft. joints than with 40-ft. joints.

Of most importance is the advantage of laying more pipe in 80-ft. joints than in 40-ft. joints. Economies are not directly proportional. Increased footage may be 30% while contractor's profit may be increased 15%.



OPERATOR of internal welding applying compressed air to the dolly for operation of rollers for lateral and rotational movement just before he rides into the pipe at Stanley-Bledsoe plant.

Three-Rack Type

The Stanley-Bledsoe double-jointing units have been developed by an affiliated firm only for contract operations at the Republic Steel Corp. pipe mill at Gadsden, Ala., and in the field. Therefore, these units are not leased or sold to other firms.

Characteristics of the Stanley-Bledsoe unit (OGJ, March 9, 1959, p. 120) include:

1. Welding on three separate racks—one for running each of the three beads—two outside and one inside.
2. Welding is done with a completely automatic welding head with constant-voltage power supply.
3. Welding speed for 0.438-in. wall is 40 to 45 in. per minute with locked-in controls for operating conditions and timing, both determined in advance.
4. The inside welder moves inside the pipe on a special dolly with pneumatic controls for roller operations.

Illinois unit. These changes have been made on the Stanley-Bledsoe unit operating at Sullivan, Ill.:

The functions of the operator inside the pipe have been reduced to those of locating the electrode over the seam, locking the machine, and operating switches and contactors that energize the welding.

After running the inside bead, the weld is inspected visually and patched if necessary before going to the fifth rack for X-ray inspection. By having as many as five racks—three for welding and two for inspection—a high production rate can be maintained while electrode travel in welding is at the comparatively slow speed of 40 to 45 in. per minute.

Lineup continues to be done with carriage-type equipment which has proved satisfactory; 10 actions are involved in these lineup operations.

Oregon units. The two double-jointing plants now operated in Oregon by Stanley-Bledsoe, for the Pacific Gas Transmission project, receive 36-in.-diameter, 0.438-in.-wall pipe from the mill with a 30°

bevel at both ends. One end of the pipe is finished with a 5/32-in. land for submerged-arc welding. The other end has a 1/16-in. land for manual electric-arc welding.

At the field plants, the lands are lightly ground with disk grinders to remove rust and to give a polished surface preliminary to welding.

To increase the rigidity needed for lineup and initial welding at the first welding rack an overhead brace has been installed. The first was made of 24-in. pipe. Later bracing for this purpose is of the truss type—lighter and more rigid—made in three sections.

To get close alignment without manual tack welding, a basic method of these units has been to start welding with a small gap at the bottom which is closed by lowering the end dolly after the first bead has been run 6 to 8 in.

Output on 30-in. for a 10-hour day is regarded as 140 to 160 welds. This amounts to 15 to 16 welds per hour.

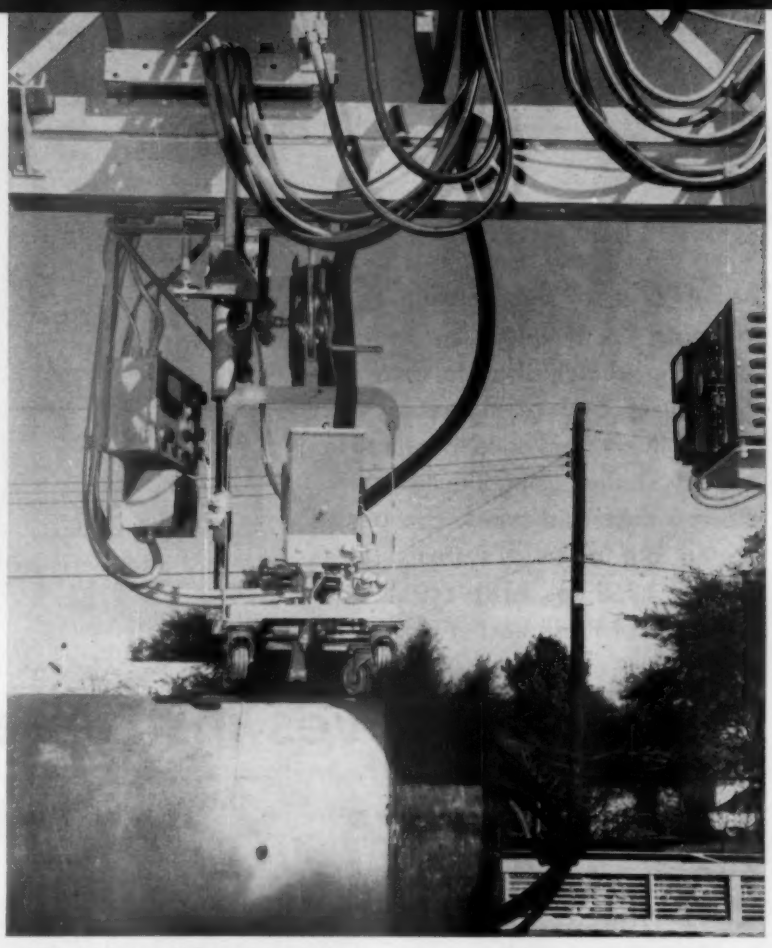
Movement of pipe from one point to another in the field-plant yards is speeded up by using 7½ and 10-ton rubber-tired high lifts of a type used in logging. After the pipe has been double jointed, it rolls on a sloping rack—first to the internal coating plant and then to the external coating plant.

One-Rack Type

The Bechtel-Perrault plant (OGJ March 23, 1959, p. 83) differs from the other two types in several ways: (1) Welding is done with one welding head on one rack, (2) only two beads are run (both of them are applied outside by the automatic submerged-arc process without manual tacking and without an inside bead), (3) a copper backup shoe protected by a woven glass-fiber sleeve is used, and (4) during welding the pipe is supported by a radial compensator—called a dog-leg compensator—to minimize strain during welding.

This type of plant has interesting possibilities for double-jointing pipe in diameters between 16 and 20 in.—too small for an inside welding operator to enter. No air clamp is now available for double jointing in this range. The smallest diameter for double jointing is regarded as 16 in.

After 10 years of ups and downs in the use of automatic submerged-arc welding, the pipeline-construction industry appears to be coming to the time when it must think in terms of 80-ft. joints instead of 40-ft. joints for more jobs.



WELDING HEAD of Crose-Price-O-Matic automatic welding unit.

In 1949 and 1950 there was a boom in the use of submerged-arc welding for double jointing. This died down to a low ebb in 1953. Since then, the changes in basic procedures for welding and pipe handling have brought a new double-jointing technique which is a distinct departure from the earlier one using three outside beads, led off with manual stringer bead and hot pass followed by two beads applied with automatic submerged arc welding.

The present techniques are highly mechanized for push-button control. Pipe handling, formerly an expensive bottleneck, has been simplified and accelerated by the improved power-operated pipe racks.

Conclusion

There is growing appreciation of the superior weld quality produced by running the inside bead. This has a beneficial annealing effect.

Double jointing seems to be most attractive for large pipe of diameters upwards from 20 in. The thicker the wall the greater appears to be the advantage of double jointing.

Advantages of double jointing are being discovered through experience. More daily footage gives a contractor a better chance to profit from spells of good weather. He gets more of the breaks.

Pipeline companies are reckoning with double jointing in planning ahead. Superior welding is to be had at the same or less cost, and a technique that helps to lower the contractor's construction costs benefits the company in the long run.

Both companies and contractors are aware of new requirements in planning for double-joint jobs. The contractor needs early pipe deliveries. He is likely to have more open ditch. Furthermore, double-jointing cost can be cut when the type of land is specified when pipe is ordered from the mill.

About 2 years ago Mission Manufacturing Co. developed a new system of instrumentation to determine the causes and remedies of valve knocks in oil-field mud pumps. Laboratory studies using the new setup showed that fluid knock can be designed out of mud systems (OGJ, Jan. 5, 1959, p. 118). Now, in an extension of these earlier studies . . .

LABORATORY INSTRUMENTATION SETUP allows Mission to make a complete study of the mud-pump system during operation.

Field test proves instruments and calculations can solve suction problems

FOR A TIME recently, Amerada Petroleum Corp. was having extreme difficulty keeping a water-injection pump in service. How this particular pump problem was solved is important not only to Amerada but to everyone who operates piston-type pumps.

Amerada's case verifies in the field some important theories that had been developed only a short time earlier on the test stand. These theories outline what causes the destructive fluid "knock" in a piston pump and what may be done to stop it.

In an article 2 years ago, Journal readers were advised to "Stop the Knocks and Save the Pump!" (OGJ, Jan. 5, 1959, p. 118). The article described a new system of instrumentation developed by Mission Manufacturing Co. The instrumentation was placed on a test pump at the company's plant as part of an investigation into wear of mud-pump parts.

This same instrumentation was put on Amerada's triplex injection pump. Here was a field trial under actual working conditions. Result was confirmation of the earlier conclusions from the test sand: fluid knock can be and should be designed out of a piston-pump system.

Holes in suction. The Amerada pump was handling produced salt water in the Fairbanks area of Harris County, Texas. At least eight times in a single 4-month period, the pump had to be shut down in order to repair holes which appeared in the suction line. Moreover, the pump was unusually noisy in operation. It had a decided knock and Amerada's men feared mechanical parts of the pump itself were being damaged.

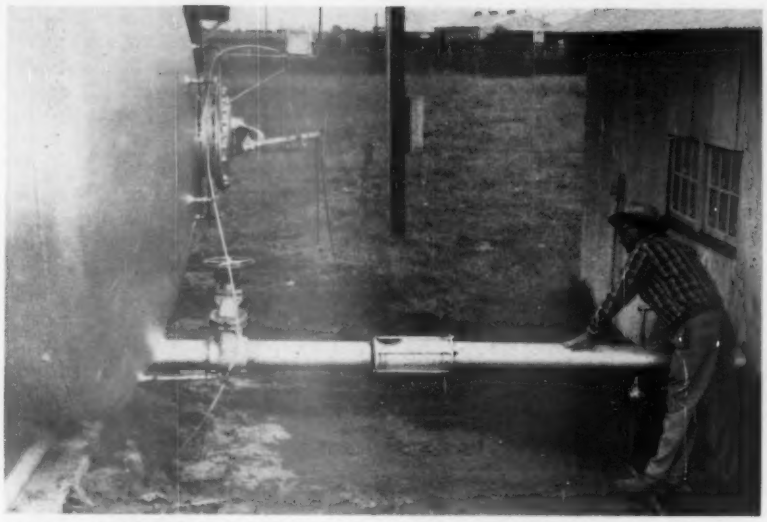
It seemed unlikely that the suction system was at fault even though it received all the visible damage. The suction line was relatively short and large—10 ft. long, 6-in. diameter—for the 2,000 bbl. of water being pumped daily. Moreover, the pump was taking suction on a large precipitator whose water level was high enough to flood the suction manifold. And, about 0.5-psi. gas pressure was maintained on the vessel.

Since the suction line was fairly new and since no other part of the system showed the same trouble, Amerada's supervisors rightly concluded that the trouble must lay in the way the pump was being operated.

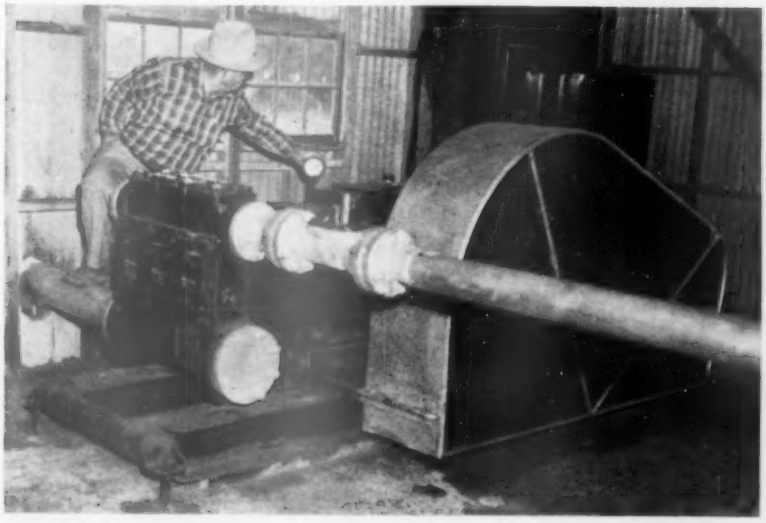
BY SAMUEL L. COLLIER

. . . project engineer with Mission Manufacturing Co., Houston. His group assembled the instrumentation which for the first time measured the stresses caused by knocking in mud pumps. He holds a BS degree in mechanical engineering from Carnegie Tech and has been engaged in engineering work with Mission since 1950. Prior to that time, he was employed as an engineer with Shell Chemical Co., Deere Park, Tex.

To make certain that there was nothing mechanically wrong with the pump itself, service men were called in from the unit's manufacturer. They found nothing in the pump which should cause the trouble in normal operation.



ALMOST CONTINUOUS REPAIR JOB was needed on this pump-suction line to keep it in operation. The line, here being examined by D. G. Mauldin, Amerada, Fairbanks, Tex., developed holes regularly. Routine checks did not reveal the cause of the trouble, so new instrumentation system was tried. Fig. 1.



LOUD KNOCK in the pump caused concern that parts in the power end might be damaged. When early attempts failed to stop knocking, discharge piping was changed to eliminate pressure drops. Though the pump is in water-injection service, its problem is similar to knocking in mud pumps and other piston types. Fig. 2.

Suspicion next fell upon the discharge piping. It was suggested that pressure surges at the 700-psi. discharge pressure might be at fault. With this in mind, the piping was modified to straighten bends and to cut pressure losses. Still the pump knocked and holes appeared in the suction line.

When nothing else readily solved the problem, Amerada asked Mission's engineers to inspect the installation and make recommendations. While Mission's work had been restricted to mud pumps, the principles involved with the piston-type triplex are similar.

Running too fast. Mission's preliminary mathematical checks turned up no apparent reason for the pump's knocking, so it was decided to instrument the pump in the same manner as the test-stand mud pump. An oscillograph was placed on the site so that a number of things could be measured and recorded while the pump was running. The oscillograph had traces for:

1. Crank angle.
2. Suction pressure.
3. Discharge pressure.
4. Sound level.
5. Plunger stress.

Since the pump was driven by a constant-speed electric motor, it could not readily be checked at different operating speeds. For this reason, the tests were commenced with the pump shut down. Then, the motor was started after the instruments were already recording. The oscillograph continued its measurements as the pump started from standstill, quickly accelerated, and reached operating speed.

Records show excess speed. When the oscillograph records were examined, the "knock" was clearly visible on measurements made at regular operating speed. Both sound level and suction pressure showed the distinctive peaks associated with knocking.

Of course there was no knock at standstill. The knock developed in the pump at some intermediate speed.

Since the oscillograph records have a time scale, it isn't difficult to calculate pump speed at any instant. Thus, speed at which knocking commenced can be easily figured. When this calculation was made, it proved the key to the entire knocking problem.

The speed at which knocking began was actually above the speed recommended for the pump. In fact, the top speed at which the pump was operating was several hundred r.p.m. faster than the maximum recommended by the manufacturer.

Source of the trouble was then quickly spotted: The electric motor driving the pump ran faster than it was thought. The motor had been fitted with sprockets as if it were a 1,140-r.p.m. motor. Actually, it was 1,740 r.p.m. There was no name plate on the motor when installed and the lease inventory showed the motor as a 1,140-r.p.m. model.

New sprockets were put on the motor and pump so that the pump would run at its recommended speed. After this, there was no knocking. Moreover, since that time, no new holes have appeared in the

NEW INSTRUMENTATION SYSTEM, brought by auto to the pump house, includes oscillograph to record pressures and stresses inside the pump as it operates. Since pump was driven by constant speed electric motor, records were made by turning on instruments and then starting pump. Fig. 3.

STRAIN GAGE on pump plunger records load. Other instruments were installed to pick up suction pressure, discharge pressure, sound level, and crank angle. Main danger in knocking is stress reversals in plunger which are transmitted back to the power end of the pump. Fig. 4.

suction line. Since the pump operates from a float control, it can still handle all the water to be pumped even at the slower speed.

The holes in the suction line were probably caused by a combination of corrosion and mechanical action. The salt water being pumped is naturally corrosive. In other parts of the system, the corrosion tends to be fairly slow because the steel scales over and no new metal is exposed.

The situation was different in the suction. The pressure surges caused by the pump knocks continually jarred loose any corrosive material in the suction line. Thus, new metal was being exposed continuously. Corrosion was accelerated, eating completely through the pipe in only a short time.

Not in vain. It is true that the trouble in this case could have been found without all the instrumentation. A simple tachometer would have detected the overspeeding. Still there was little evidence that speed was the problem. And, experienced pump men had not detected this fact.

Amerada's experience showed something more than the simple fact that overspeeding can make a pump knock. In the larger view, the important thing is that the field case agreed with the conclusions made on the test stand.

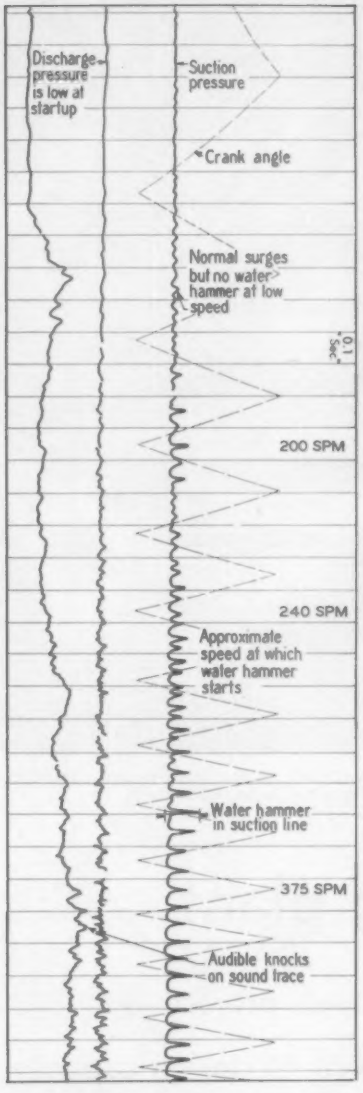
Fluid Knocks

Even when a piston pump is running perfectly, it has normal "operational sounds." These indicate no trouble. Most problems arise from "knocks," some of which are mechanical and some of which are fluid.

Overspeed is not the only cause of fluid knock. Anything which prevents normal filling of the cylinders can have the same effect. To understand how to avoid these knocks, it is important to know their cause. The instrumented test-stand work showed for the first time the nature of knocking.

When the piston is at the start of its stroke, its velocity is zero, but it picks up speed quite rapidly, As the piston moves forward on its stroke, it should be followed by the fluid it is pumping. However, the inertia of the fluid holds it back. Usually, there is enough pressure head on the fluid so that it follows the piston in spite of its inertia, resulting in normal operation.

However, the case is different if there isn't enough pressure head on the fluid. The fluid may not be able to follow the rapidly accelerating piston and literally falls behind, leaving a void in the cylinder. Until midstroke, the piston continues to increase in velocity; at midstroke it begins to slow down. The fluid, however, continues accelerating because it is rushing into the void left by the piston. Thus, the fluid velocity continues to rise and even


Discharge pressure is low at startup
Suction pressure
Crank angle
Normal surges but no water hammer at low speed
0.1 Sec.
200 SPM
240 SPM
Approximate speed at which water hammer starts
Water hammer in suction line
375 SPM
Audible knocks on sound trace

OSCILLOGRAPH RECORD taken as the pump accelerated from standstill to full speed. Note from crank angle trace the gradually increasing speed. Suction pressure shows extremely sharp peaks as knocking begins at some intermediate speed. Sound trace acquires noticeable pulsations which correspond to the audible knock. Constant-speed electric-motor drive prevented testing pump first at one speed and then another. Final remedy: Install new sprockets to operate pump below knocking speed. Fig. 5.

exceeds the peak velocity of the piston.

As the piston slows down past midstroke, it is overtaken by the fluid. At this instant when the fluid collides with the piston, the fluid must suddenly slow to the speed of the piston. The fluid is arrested so suddenly that there is a large surge in pressure and a water hammer or fluid knock.

Ways to prevent knock. Obviously, we could prevent all knocks if we could keep enough pressure head on the fluid entering the cylinder. That is, the "net positive suction head" or NPSH should be above the value where knocking occurs.

For centrifugal pumps, there are charts which show what NPSH must be to prevent cavitation and other problems. Unfortunately, there are no such charts for piston-type pumps. You may get an idea from Fig. 6 what an NPSH curve might look like for a piston-type mud pump. Suppose this were for the Amerada water pump; you can see that if the pump were operating below the "required-pressure line," it would knock. But, if the pump were slowed down, less NPSH would be needed.

The NPSH for any pump is figured in this manner: Take the total absolute (including atmospheric) head above the pump; subtract from that (1) the vapor pressure of the liquid at the temperature it is being pumped, (2) the friction loss in the suction line, and (3) acceleration head.

You can see that if a pump is knocking, we should take steps which do one or more of these things:

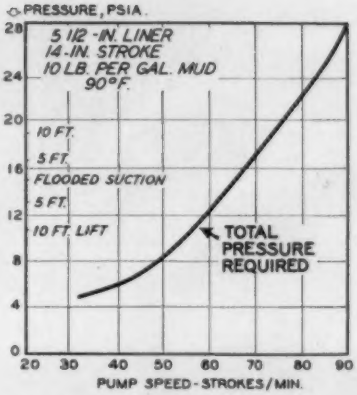
1. Increase total head of fluid above the pump.
2. Reduce vapor pressure of the liquid.
3. Cut friction loss in the suction line.
4. Reduce the acceleration effect.

We can increase the head above the pump in many ways. Most common are to raise the level of the fluid in relation to the pump or to use a charging pump of some kind.

It isn't often in oil-field operations that vapor pressure of the liquid can be reduced practically but tankage should be large enough to keep the fluid cool, preferably below 150° F.

Friction loss and inertia in the suction line can be reduced by: (1) increasing the diameter of the suction line, (2) shortening the line, (3) removing bends or other restrictions.

On drilling rigs, there are times when the mud pump may begin knocking after long periods of normal operation. Often, the knock



NPSH CHART for one mud pump under one set of conditions. Chart is similar to those used in figuring suction systems for centrifugal pumps. This type chart for mud pumps and other piston types would ease problem of designing knocks out of the suction. Fig. 6.

can be traced to one or more of the following:

1. Running the pump faster than before.
2. Use of heavier mud.
3. Higher mud temperatures.
4. Collapsed or clogged suction.
5. Drop in fluid level in tanks.
6. Fouled intake valves.

Why knock is bad. Its noise is not the bad feature of a pump knock. Nor does the knock interfere with the volumetric efficiency of the pump; the cylinder fills completely on each stroke in spite of the knock. The trouble is that a bad knock can double the number of stress reversals on pump parts. And, the life of most of these pump parts goes down almost directly as the stress reversals go up.

The knowledge about stress reversals came about by putting strain gages on piston rods used in the test mud pump. The oscillograph record shows sharp drops in rod stress at the instant that a pump knock occurred. The unusually high pressure caused by the knock on the suction side of the piston, partially balances pressure on the discharge side of the piston. Result is a stress reversal in mid-stroke in addition to the reversal caused by normal suction and discharge.

Since a mud pump is designed to deliver only a certain number of cycles (or stress reversals) during its useful life, a continuous knock can cut service of many parts virtually up to half.

PROCESSING UNITS at Humble's King Ranch gas plant are at left center. Absorption units are in the middle, and compressor building is at far right. Cooling tower is in foreground, while electricity-generating plant is at upper left.

Largest U. S. gas-processing plant now in operation—Humble's King Ranch project handling 545 M.M.c.f.d. of gas, 57% of its design capacity

LARGEST gas-processing cycling plant in the United States, the King Ranch gas plant of Humble Oil & Refining Co., is now in operation. The giant plant, which covers a 151-acre site about 14 miles southwest of Kingsville, Tex., is designed to produce 950 M.M.c.f.d. of gas.

The plant required more than 1 year to build, after 5 years of meticulous planning had gone into its design.

The new plant is the focal point of a vast gathering system in which gas is collected through 170 miles of gathering lines from 13 producing fields scattered over a wide area of Southwest Texas (see accompanying map). Also tied into the plant is Humble's new 30-in. industrial gas-transmission line which parallels the Gulf Coast, 238 miles from the King Ranch to the Houston area.

Total cost of the new facilities, including the King Ranch plant, field gathering system, and gas-transmission line, amounts to approximately $68 million.

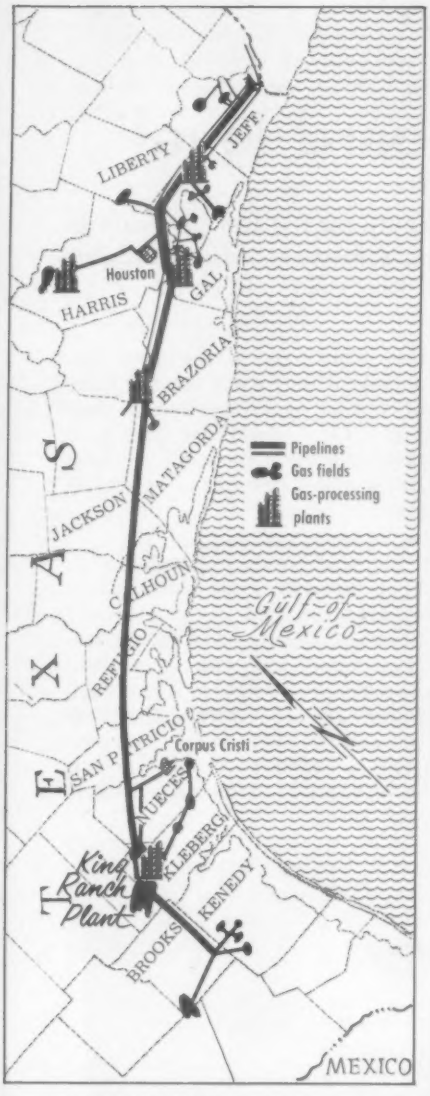
Why it was built. Three significant factors were considered in the decision to build this vast gathering-processing-transmission setup:

1. Increasing demand for industrial fuel. Rapid development of industry in the Houston and Beaumont-Port Arthur areas points to the need for additional supplies of gas in quantity.

2. Growth of petrochemical industry. Expansion of the petrochemical industry along the Gulf Coast indicated increased need for liquid products which can be extracted from natural gas. These liquids are raw materials for many petrochemical processes.

3. Economic utilization of gas reserves. Cycling operations are being carried out at King Ranch, because there is need for the liquid products, over and above the need for the gas from which these liquids are extracted. And, there is need to retain some of the gas in the reservoirs to maintain pressure. If pressure is allowed to drop significantly, production of both oil and gas liquids is reduced.

Processing plans. The gas plant is now processing about 545 M.M.



GATHERING LINES and 30-in. transmission line connected with King Ranch system. Total investment is about $68 million.

GAS DISPATCHER uses telemetering system to keep close tabs on gas coming into and going out of plant. Telephone and radio systems provide fast communication.

c.f.d. of gas. Later this year the rate will be increased to around 680, and soon after to 800 M.M. c.f.d. No information has been released as to when the plant will reach the design capacity of 950 M.M.c.f.d.

Under normal operations at the processing rate of 680 M.M.c.f., the plant will yield approximately 27,800 bbl. of products daily. In this total will be about 5,700 bbl. of ethane concentrate, 6,100 bbl. of propane, 2,100 bbl. of isobutane, 2,400 bbl. of normal butane, and 11,500 bbl. of debutanized gasoline. The dry gas made available at this rate of processing will be split into three streams:

- Approximately 325 M.M.c.f.d. will be injected into reservoirs being cycled, and 55 million cubic feet will be injected into oil reservoirs for pressure maintenance.
- About 60 million cubic feet will be consumed as fuel for the processing plant and as product shrinkage.
- The remainder, varying in quantity according to market demands, will be pipelined to Houston for industrial use.

The processing scheme for the plant is conventional. Liquids are removed from the rich gas by oil absorption and are later stripped out of the absorption oil. The gas-liquids stream is then separated by fractionation into its various product components.

Enriched-gas injection. Recovery of oil will be increased by the injection of enriched gas into King Ranch oil reservoirs. This technique is being used because it has been found in laboratory experiments that where dry-gas injection enables recovery of 23% of the oil in place, the injection of gas enriched with ethane or propane results in a recovery of more than 90%.

Enriched-gas-injection projects have already proved successful in Seeligson field on the King Ranch, and Humble plans to start similar projects on three more reservoirs in the near future.

King Ranch oil and gas. Humble, which owns all King Ranch leases, has discovered 21 oil and gas fields on the ranch. Six of these fields are producing gas to the new gas plant, as are seven other fields in the area surrounding the ranch.

Additional fields will be tied into the system later. Even now, the gathering system includes such faraway points as Flour Bluff field, 49 miles northeast of the plant, and Kelsey field which lies 51 miles to the southwest.

Photographs for this article were furnished by Humble Way magazine, and the article is based on information from this same publication.

Review safety records at board level

• A 10 to 25% improvement in a company's safety record can be made in the first year if the board of directors reviews safety records at regular monthly board meetings.

BY JAMES H. HERBERT
Consultant,
Accident and Fire Prevention,
Greenwich, Conn.

HIGH FREQUENCIES of accidents and fires generally reflect the same conditions which produce other management problems. An entire company, plant, or area safety experience is one of the best indicators as to how well a particular operation is being managed. Fundamentally, the factors listed as essential to a sound safety program are equally essential to a sound over-all good management program.

In the light of this, a question can be reasonably asked, "If we have good management programs we will also have good safety programs, so why worry about a safety program?" Speaking mathematically, this is correct, but experience has shown that a sound safety program is needed and that many objectives can be reached through safety which are otherwise difficult of attainment.

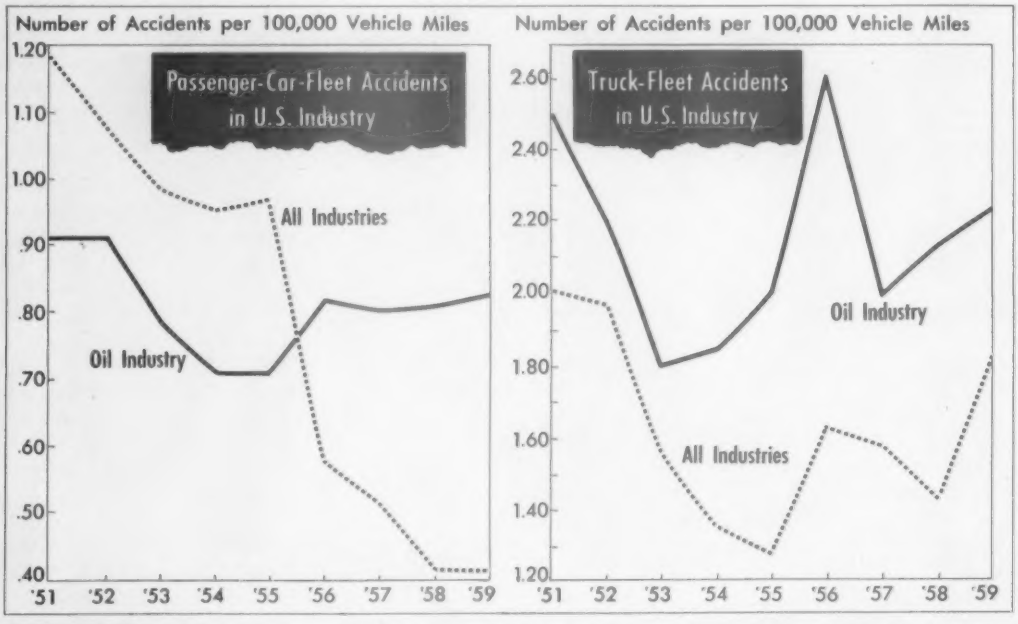
Part 1 of this series appeared in the February 6 issue.

In my estimation, a bad accident and fire record points more quickly than any other single factor to a breakdown in good management techniques, and the breakdown generally starts with top management.

I believe that the degree of sincere, intense interest in safety on the part of top management in any company tells the tale as to whether the safety experience in that company is excellent, good, mediocre, or bad. Presidents and other company officers are invariably most cooperative in helping to launch a safety program and in assisting at formal safety functions. I believe they would do so far more frequently if they could see the value of regular contributions on their part. They would not only help their company's economic situation but would find many rewarding personal benefits.

Regular consideration. Plant or field supervisors are interested in safety, but would be to a greater degree if their field or plant managers would talk with them about it regularly. Plant or field managers will, in like manner, improve the safety record throughout their area of authority if their department heads regularly discuss safety with them.

Vice presidents or department heads are no exception. If the board of directors of a company reviews at its regularly monthly meetings the injury and fire record for



PASSENGER-CAR accidents in the oil industry have leveled off at a rate that is twice as high as other industries. Although the oil-industry truck-accident rate is climbing again, it isn't quite as rapid as other industries.

the previous month for the principal departments, the department heads are going to direct the safety effort out through their operations more effectively.

There is an argument to the effect that a detail such as safety should be left to the department heads and field managers—that the board should interest itself only with the board policies and declare itself only to the degree that it wants its operations to be safe ones.

However, a board does review many other operating details. Close attention to safety on its part will pay far greater dividends than may appear on the surface. In the first place, board members do not want employes to be injured or killed, so they would feel that they were playing more of a part to prevent such incidents. Secondly, since injury and fire records are closely related to efficiency of operations, they could find, in safety, another channel whereby an operation's efficiency could be reviewed.

A department head isn't going to listen too often at board meetings to unsatisfactory safety-record reports of operations under his sphere of influence without taking strong action. Such action will generally bring about more efficient operations.

Computer calculates compressor size in almost nothing flat

1 **SALES ENGINEER** puts necessary information on data sheet and teletypes it to main-office computer-applications group.

2 **INFORMATION** from the data sheet is checked, punched onto cards, and read into an IBM 650 computer.

3 **COMPRESSOR** size is returned to branch-office sales engineer by teletype in less than 4 hours' time.

RECIPROCATING COMPRESSORS are now being sized by Cooper-Bessemer Corp. on an IBM 650 computer. The sizing program performs in a single run virtually all of the computations essential to unit sizing and cylinder selection. Given capacity, the computer solves for horsepower; given horsepower, the computer solves for capacity. In either case the program proceeds and, for any number of stages and any combination of variable suction or variable discharge pressures, solves for PDEV (piston displacement x volumetric efficiency) cylinder sizing requirements at all possible sizing points.

All of the intricacies of calculation procedures are included, . . . B.hp./M.M. curves, specific-gravity corrections, low inlet pressure corrections, moisture factors, pipeline factors, small unit factors, and most significantly, all of today's complications concerning compressibility factors.

The procedures have been designed around teletype transmittal of both problem data and answers, and a tentative schedule has been set up. Problems whose complete data are received at the plant in Mount Vernon, Ohio, by 11:00 a.m. are answered over the teletype by mid-afternoon of the same day.

Two years of gas-well testing convinces Shell that

Rotary p.d. meters will work in the oil field

Here's a report on the engineer's evaluation tests

BY R. B. SYMON
Shell Oil Co.

ON MAY 21, 1958, a 4 by 8-in., 125-psi.-working-pressure rotary positive-displacement gas meter was placed in well test service by Shell Oil Co. at an offshore Louisiana location.

This is the first known application of this type of meter in the oil fields although this particular meter has been manufactured by Roots-Connersville (Division of Dresser Industries) for more than 50 years.

Up to this time, application for this type meter, in this country, has been almost exclusively by utility and large industrial concerns. As a result of this installation and other evaluations, it is now felt that this meter is well suited for oil-field service.

Like a gear pump. Basically the rotary p.d. gas meter is similar to a gear pump in design and operation, Fig. 1. Gas flowing into the meter cylinder causes the gear-type impellers to rotate due to pressure differential across the impellers. As the impellers turn they trap a known volume of gas in the spaces between the case and the impellers which is exhausted downstream as these spaces open into the discharge side of the meter. Clearances between the impellers and case are held to close tolerances to prevent slippage.

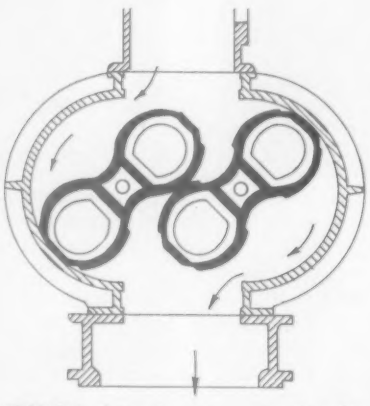
A simple mechanical counter connected to the impeller shaft totals up the gas displacement as the impellers turn.

Pressure drop across the meter at maximum rated flow is only a few inches of water. A typical proof curve and pressure drop curve for this 4 by 8-in. meter are shown in Fig. 2.

Because this meter is of the p.d. type the only factors needed to convert measured displacement to standard cubic feet are temperature, pressure, and compressibility factor. And the latter is needed only at high pressures.

Until recently this meter was only made in 25, 50, and 125-psi. working pressures, so compressibility was not considered. Temperature and pressure compensation may be done automatically and continuously by using one of several available compensating devices. In our case the American Meter Base Volume Index was used. This was mechanically connected to the impeller shaft through a suitable gear box.

Remote telemetering may be accomplished simply by attaching an electric or pneumatic switch to the output counter of the meter—either compensated or uncompensated. Fig. 3 shows the 4 by 8-in., 125-psi.-w.p. meter as installed at Shell's offshore location complete with base volume index plus electric signaling contacts.



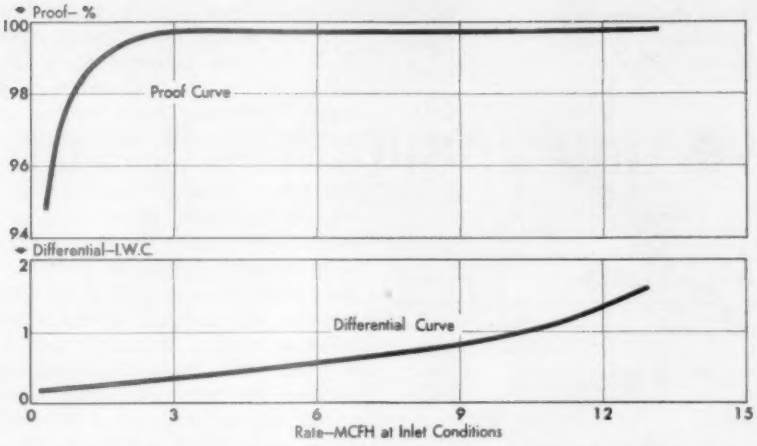
SECTION through rotary positive-displacement gas meter. Arrows show direction of flow. A fixed volume of gas is swept through the meter on each revolution of the impellers, and a counter on the shaft of one of the impellers gives a direct reading of the gas volume. Fig. 1.

Meters studied. About 6 months prior to this first installation, a series of comparative tests was run on a number of selected gas meters under controlled steady-flow conditions. These tests were set up to tell us whether any particular meter showed promise as a wide-range, fast-response meter that would accurately total the flow in standard cubic feet.

Results of our tests showed that the rotary p.d. meter had a rangeability of greater than 50 to 1 with an accuracy of ±1% of rated capacity. Further, the meter required no external source of power, totalized flow in terms of standard cubic feet, could be provided with signaling contacts, and was relatively simple to understand and operate.

Primary disadvantages noted were that (1) it was only available in cast-iron construction, (2) 125-psi. working pressure was the highest available, (3) the smallest meter size made in 125-psi. rating was a 4 by 8-in. with a rated capacity of 8,000 cu. ft. per hour (about 2.5 M.M. s.c.f.d at 125 psi.), (4) the meter was bulky and heavy, and (5) the meter was expensive compared with the conventional orifice meter. None of these disadvantages appeared difficult to overcome; however, before proceeding further, we wanted to field test this type of meter, under low-pressure well-test service to see if the basic meter design would present unforeseen difficulties in the oil fields.

Field tests. Starting in 1958, comparative well-test gas measurements were obtained using the rotary p.d. meter and a conventional bellows-type orifice meter with 24-hour



TYPICAL PROOF CURVE for a 4 by 8-in., 125-psi. w.p. rotary positive-displacement gas meter. Fig. 2.

clock. These meters were connected in series.

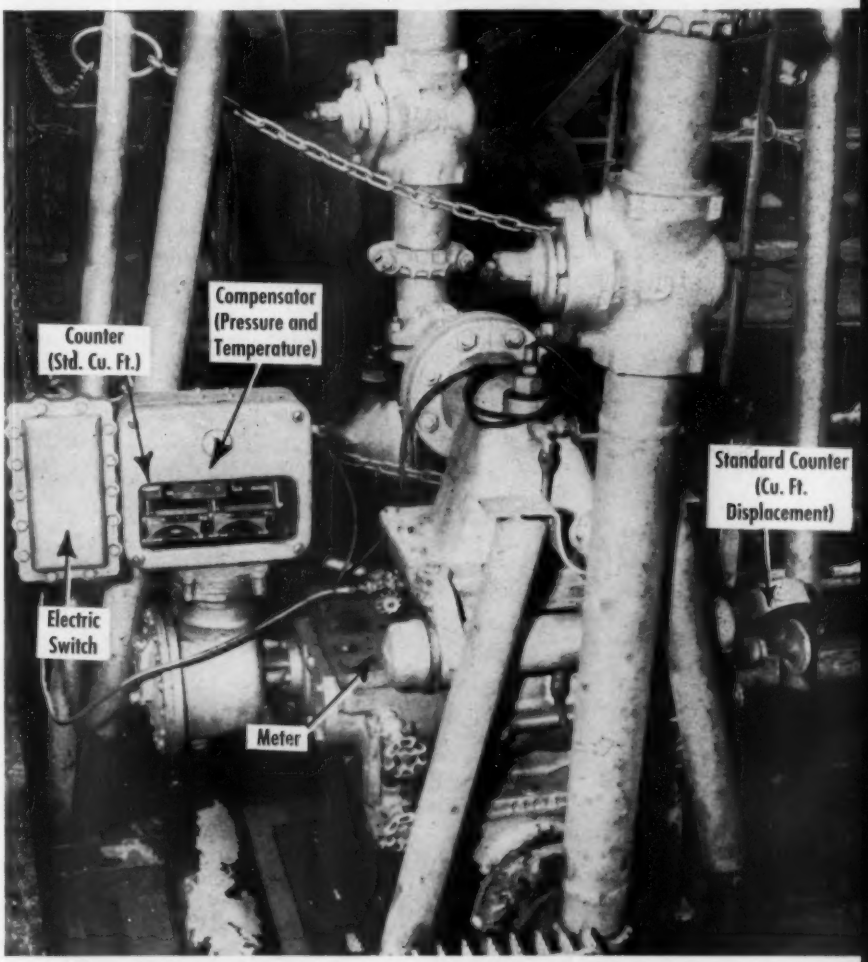
In 8 months a total of some 70 comparative measurements were made under routine operating conditions, the results of which are shown in Fig. 4. A tabulation of these data showed that 68% of the test results of the fully compensated rotary meter and the uncompensated orifice meter (to which assumed factors were applied) were within ±10% of each other, 90% were within ±20% of each other, and 96% were within 30% of each other. Fifty-two of these tests showed the rotary-meter measurements to be higher than those indicated by the orifice meter. The average deviation of these 52 high values was +9.2% and the average deviation of the remaining 18 low values was −10.8% with an overall average deviation of ±9.6%.

In view of the wide and rapidly fluctuating flow rates and the use of predetermined compensating factors for the orifice-meter readings, these results were not unexpected nor were they felt to be unreasonable.

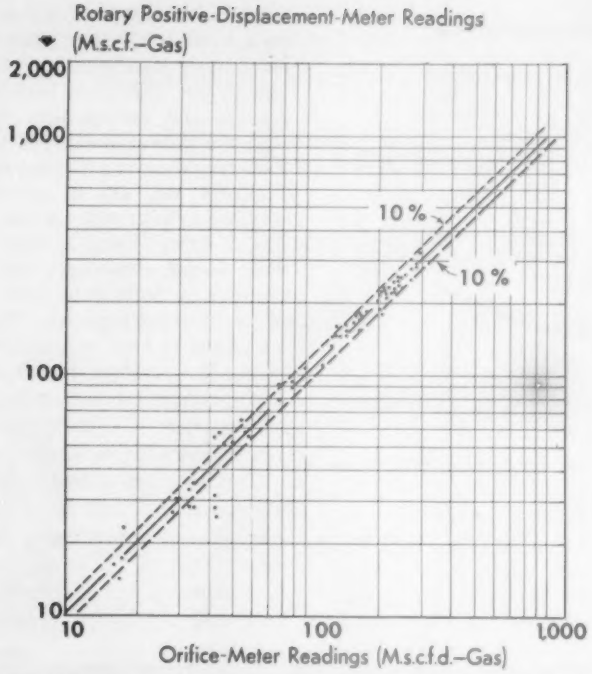
As a result of this 8-month field test it was concluded that (1) the rotary positive-displacement meter was suitable for routine oil-field service and (2) this meter was at least as accurate as the orifice meter in well-test service.

This test was encouraging but it was felt that more absolute test data were needed to establish the accuracy of this meter under widely fluctuating flow conditions. Accordingly, arrangements were made with Roots-Connersville to use its 2,800-cu.-ft. prover tank as a primary standard and attempt to obtain such data under simulated flow conditions at its factory. Tests were run on a similar 4 by 8-in. meter without automatic compensation by comparing the difference between beginning and ending tank volumes with the indicated metered volume. Two tests were run. During the first, 2,275.93 std. cu. ft. of air was displaced from the prover tank. This volume flowed at rates which were varied continually and indiscriminately from 0 to over 200% of meter rated capacity. Flow-rate variations were accomplished by manually operating the bleed valve of the hydraulic piston on the prover tank as fast as a globe type valve can be operated by hand.

This first test showed the meter to register 5.57 cu. ft. or 0.245% more than the prover tank displacement. Due to the short length of large-diameter piping between the tank and the meter, pressure dif-



ROTARY P.D. GAS METER installed with pressure and temperature compensator and electric telemetering switch. Fig. 3.



TEST RESULTS for 24 hour measurement by rotary p.d. gas meter and simultaneously by orifice meter. Note that most points fall inside the 10% lines. Fig. 4.

ferences were considered to be negligible. Likewise temperature differences were not taken into account, although during the test it was observed that temperatures of the meter were slightly higher than in the tank. This would account for a portion of the difference.

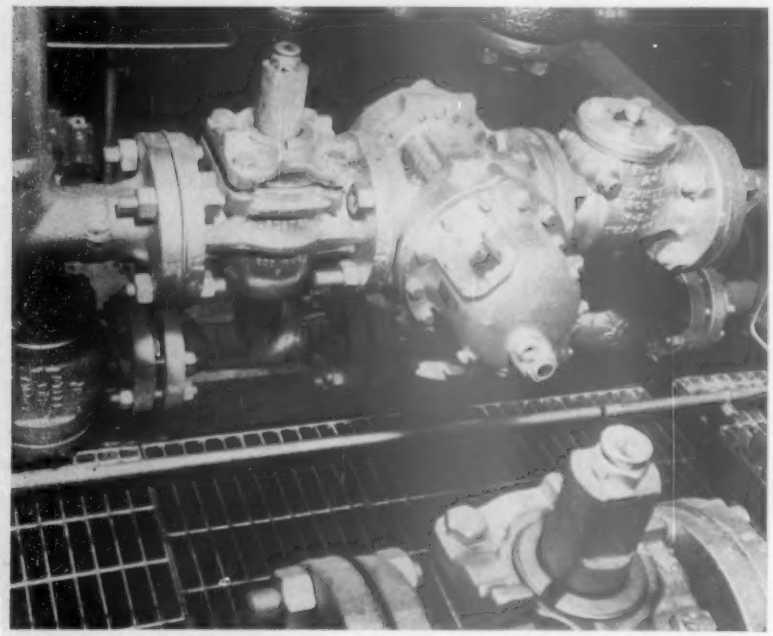
The second test was performed similarly except that during the first portion the flow rate was varied from 0 to 100% of meter rated capacity and during the last half from 0 to 50% of meter rated capacity. A good portion of this last half was at the lower rates. Also during this test, temperatures at the meter and in the tank were read every 5 minutes from which an average temperature difference was calculated. The results of this second test, without temperature correction, showed the meter to register 0.192% more than the prover-tank displacement. When the temperature correction was applied this difference was reduced to 0.156%.

As a result of these two tests it was felt that enough satisfactory evidence has been obtained to attest to the absolute accuracy of this type meter under rapid and widely fluctuating flow conditions.

Since this time Shell, in the New Orleans area, has installed approximately 18 of these meters with only 1 meter breakdown to date. This was a bearing failure which occurred after a test separator malfunctioned and caused fluids to carry over into the gas line. This left a lot of sand deposited in the gas meter which was not completely cleaned out before being placed back in service. The original meter installed in 1958 is still performing with no indicated wear and no failures or maintenance problems to date.

All meters installed have been 125-psi.-w.p. ranging in size from the new model 3M125 (3,000 cu. ft. per hour), Fig. 5, up to the 6 by 10-in. size (18,500 cu. ft. per hour). A 600 and a 1,200-psi.-w.p. meter are now available, but no detailed information has been obtained on these newer models.

In the meantime, Shell has also been evaluating "off-the-shelf" rotary positive-displacement liquid meters in gas service. To date both high and low-pressure meters of this type have been used successfully in gas service for some time. Testing of these meters is not yet complete but results so far are favorable.



ROTARY P.D. GAS METER installed in a horizontal line, and not equipped with compensating devices. Fig. 5.

Conclusion

There is no reason known to limit the application of the rotary positive-displacement gas meter to well-test service. In fact, many other possible applications are foreseeable in the oil field, especially as new models become available in higher working pressures and lower flow ratings.

How the pumping unit evolved

BY JOSEPH ZABA

APPLICATION of basic principles of unit geometry, counterbalance, and torque to the requirements of a unit pumper will be the subject to the next few parts of this series. The principles have already been covered in Parts 3 to 10.

Pumping-unit evolution. Self-contained, skid-mounted "pumping units" began replacing the standard rig fronts during the twenties. Since this time pumping units have undergone a pronounced evolution. Contributing factors were the increasing depth of pumping, increasing application of engineering sciences both to design of units and to calculations of pumping installations, and economic factors. Early units were built with substantial safety factors in the knowledge that they would be subjected to frequent misapplication and overloading. As the methods of sizing of units to the expected well conditions improved, and as the competitive conditions of the pumping-unit market became more acute, more and more effort was devoted to the engineering design of the units to improve efficiency and to reduce weight and price, while keeping within safe limits of the applied load.

Importance of the geometric layout of the unit, to assure efficient application of power was recognized early. Many efforts have been made toward improving design of the unit, particularly in the last few years. This is apparent from the number of new units brought out or being brought out by different manufacturers. New principles, or rather new applications of the old principles, have been field tested and reported in the literature.[1 2 3]

A trend toward geared speed reducers started early and this type is now predominant. Original worm-gear reducers furnished smooth and silent power transmission. But their efficiency was low. The spur gear was more efficient, but was noisy. Modern helical and herringbone gear reducers combine quietness and smoothness of operation with high transmission efficiency.

A pumping-unit reducer consists essentially of seven elements: (1) Shafts which are subjected to torsion and bending, (2) bearings which are subjected to pressure, (3) gears which have to withstand tension, impact, and wear, (4) housing which must resist pressure, (5) lubricating system, (6) sealing system, and (7) foundation.

Of these seven elements, proper foundation and proper lubrication are within the control of the user. Use of proper lubricants, periodic testing of oil in the reducer and replacement or cleaning of the oil are now accepted operating practices.

Importance of easy counterbalance adjustment was also recognized early. The first crank counterbalance which could be adjusted by one man appeared around 1925. And around 1950 most commercial pumping units were equipped with this type of a counterbalance. Introduction of the air-balanced units in the early thirties was another contribution to easy balancing of the units.

Pumping-unit rating. For many years there was some confusion about rating pumping units. Any one of these factors was used as a basis: horsepower, horsepower per revolution, crankshaft size, crank pull, torque, chain size, or plunger size that the unit could handle for a given depth. It is easy to see that the opportunity existed for misapplication and that there was a need for a uniform rating method.

Standardization committees of the API, in cooperation with users and manufacturers, established pumping-unit ratings based on maximum permissible torque and on the loading which the structural parts of the unit should be able to withstand.

In the early forties an attempt was made to broaden the scope of standardization. In 1943 a special subcommittee of API proposed: (1) Establishing a simplified series of reducer peak torque ratings, (2) a series of structure, maximum-stroke, and polished-rod ratings, and (3) certain dimensional standards for some structural components of the unit.

The proposal was widely circularized through the means of a questionnaire directed at the users and the manufacturers. The survey showed that there was close agreement on the proposed series of torque rating. This rating was adopted and periodically other ratings were added to the standards as the sizes of the commercially available units continued to increase. Now the newer API Standard 11-E "API Specification for Pumping Units," March 1960, provides for 16 sizes of reducers and peak torque ratings from 6,400 to 1,824,000 in.-lb., with single, double, and triple reduction.

Because of lack of agreement the other two portions of the proposal were dropped from consideration. There was particular opposition toward establishing dimensional standards.

Because API standards contained only specifications for reducers and walking-beam design, there developed over the years a large number of variations in design of pumping units. As an illustration one size of one make of a pumping unit is available in over 30 different models representing different combinations of maximum strokes, structure ratings, and counterbalance capacities. This condition, brought about by varying requirements of the users and the need to meet competition resulted in increase of manufacturing and stocking cost which had to be ultimately absorbed by the buyers.

In 1958 R. E. Hicks and B. G. Agnew presented a paper in which they proposed a balanced design of pumping units based on the allowed stress of the sucker rods.[4] The beam capacity should be capable of using the rod string to its maximum selected stress. Since there are five API sizes of sucker rods, for any agreed-upon rod stress there would be five classifications of beam capacities. The maximum permissible unbalanced load for a unit with a given maximum stroke and a given torque rating determines the minimum counterbalance effect needed for operation of the unit without overload. Maximum counterbalance capacity of the unit should be such as to permit use of the unit to the depth permitted by the beam and the rods.

The approach is logical. It could not, however, form a basis for general standardization because there is little probability of arriving at an agreement between users and manu-

facturers regarding standardized allowable sucker-rod stresses.[5]

In 1958 a special committee of manufacturers presented to the API a proposal for establishing a series of pumping-unit ratings composed of standard combinations of torque, stroke, and structure capacity. The combinations of strokes and torques selected were those most frequently used as determined from the sales records over a 2-year period. Some of the figures on strokes were adjusted to provide uniform increments of strokes between unit sizes. The beam capacity was established on basis of peak torque formula assuming 75% counterbalance as a practical maximum for most pumping conditions.

$$T_{max} = (P_L - CB) \times \frac{S}{2} \qquad (1)$$

Since $P_L = C$ then $CB = 0.75\,P_L = 0.75\,C$

Solving for C

$$C = \frac{8 \times T_{max}}{S} \qquad (2)$$

Where:

T_{max} = peak torque
P_L = maximum polished-rod load
CB = counterbalance
C = beam capacity
S = stroke.

Three sets of unit series were proposed: the basic Series "A," and Series B and C, which for any given reducer provide a maximum stroke longer than that of Series A. This increase may be attained either by increasing the crank length or the length of the front portion of the beam. If the first of the two methods is used the beam capacity is proportionately reduced (Equation 2). Therefore, Series B and C provide two beam capacities for each reducer rating.

After nearly 2 years of discussion the proposal was approved and is given as a "Tentative" Standard in the 1960 edition of Standard 11-E. Change from a "Tentative" to a "Standard" status is now being balloted upon. Most of the new units now being brought out by the manufacturers are already complying with this Standard.

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BOOK

ELEVENTH ANNUAL INSTITUTE ON OIL AND GAS LAW AND TAXATION. Published by Matthew Bender & Co., Inc., 255 Orange St., Albany 1, N. Y. 706 pp. $18.50.

The papers in this volume represent all of the lectures prepared by leading oil and gas experts and presented at the 11th Annual Institute on Oil & Gas Law and Taxation, sponsored by the Southwestern Legal Foundation.

These papers form an important link in the continuing search for greater understanding and technical competence in the field of oil and gas. The articles have been, in most instances, expanded beyond their original lecture form, and enjoy the advantage of footnote citations and other helpful addenda, as well as indexing.

Among the matters discussed are the following: background and analysis of the trial examiner's decision in the Phillips case, problems peculiar to state and municipal regulations of gas-distributing companies, preparation for gas-rate hearing before the Federal Power Commission, producer contracts for the sale of natural gas in interstate commerce, possible liabilities arising from violations of conservation orders, adverse possession, limitations, or acquisitive prescription as to severed oil and gas interests, and legal problems in pooling, unitization, and joint operation of oil and gas interests.

In addition, the following are discussed: state taxation of oil and gas, tax consequences to lessee of bonus paid for an oil and gas lease, the ABC deal, recent development in oil and gas taxation, and collapsible corporation in oil and gas: does the 1958 act afford any relief?

Ordinary pressure vessel converted into separator

MANY SMALL COMPANIES have pressure vessels in their yards that can be converted into separators. There are usually enough connections on the vessel to accommodate the inlet line and the two outlet lines. The float chamber can be connected to the outlet line before the fluid hits the dump valve.

The float chamber is mounted on a union screwed into a tee looking up between the separator and the dump valve. The float chamber has a built-in tee to accommodate the arm coming over from the float to the torsion tube on the control box. The top of the chamber has a blind union to facilitate repairs. The ¼-in. connection on the side goes to the pressure gage and over to the separator. A tee in this line provides a tap for the control pressure, which is regulated. Outlet for the control is connected in the usual manner to the diaphragm on the dump valve.

On the gas outlet line, the back-pressure valve is mounted in a vertical position to prevent the formation of hydrates and the usual connection above it is made for lease fuel.

W. L. NELSON, Technical Editor and Petroleum Consultant

Questions on TECHNOLOGY

Reforming to 100 clear octane is easy

. . . if you have the right charge stock

At one time you published the relationship of reformer yields to octane number of the reformate. Can it be extended to high octane cracked feed stocks?—R. W. F.

You are referring to the issues of August 26, 1957, p. 129 (Platinum Reforming Yields at High Octane Number) and the earlier one of January 3, 1955, p. 117 (Yields by Platinum Catalyst Reforming). Theoretically these can be extrapolated in estimating yields from high-octane feed stocks but too much extension of the data is required. Accordingly, 16 sets of data (see references) involving over 120 sets of experimental results were correlated as indicated in the three figures. Unfortunately, there were only five sets of data on exceedingly high-octane (75-88) feeds. In general, the accuracy of the correlation is within plus or minus two units of clear octane number (research) but most of the data check more closely with the correlation.

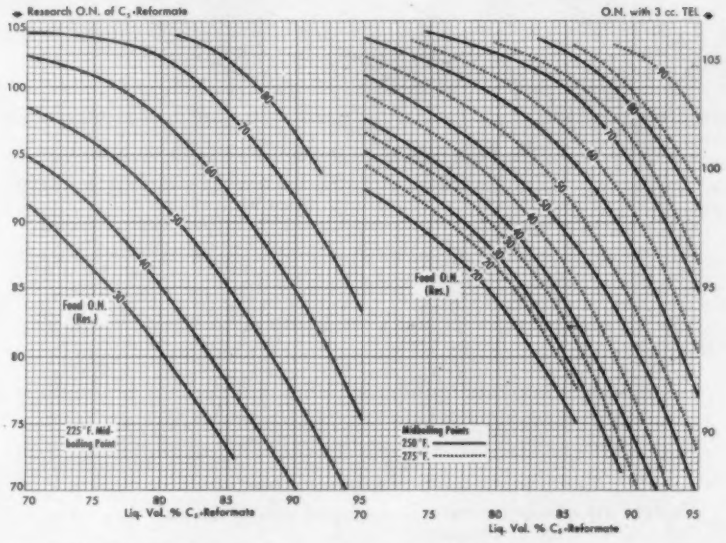
You probably have in mind the increasing number of general statements in the literature regarding the catalytic reforming of heavy catalytically cracked gasoline and of thermally cracked gasoline. Foreign refiners have been especially active in developing such operations. Obviously, any clean naphtha that contains large amounts of naphthenes can be upgraded in octane number by platinum-catalyst reforming. In fact, the recent developments of hydrocracking are closely related to catalytic reforming. In time we will probably be able to handle almost any clean petroleum stock by combination processes of cracking (decomposition), hydrogenation, dehydrogenation, and isomerization.

Variables that affect yields are primarily (1) octane number of the feed, (2) boiling point of the feed, and (3) the octane number of reformate that is desired. With the feeds thus far examined by the industry, the high-boiling ones are much superior. This is evident in Fig. 3 for operations which produce 85% of debutanized reformate.

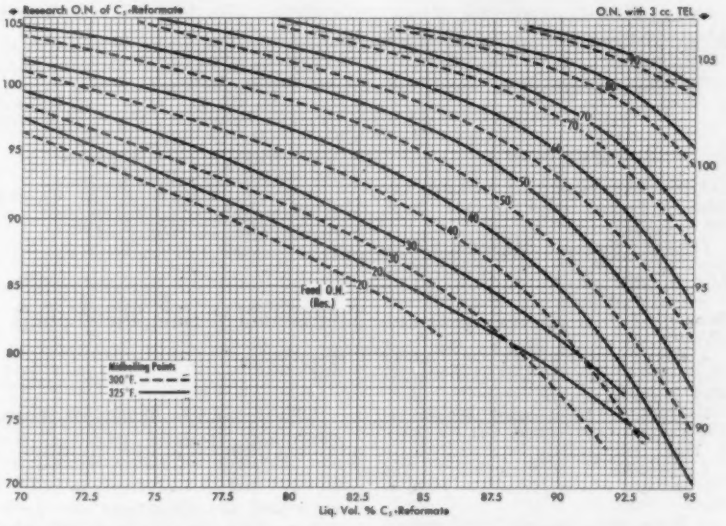
Thus, except for cost, catalytic

TABLE 1—YIELDS OF REFORMATE FROM VARIOUS CHARGE STOCKS

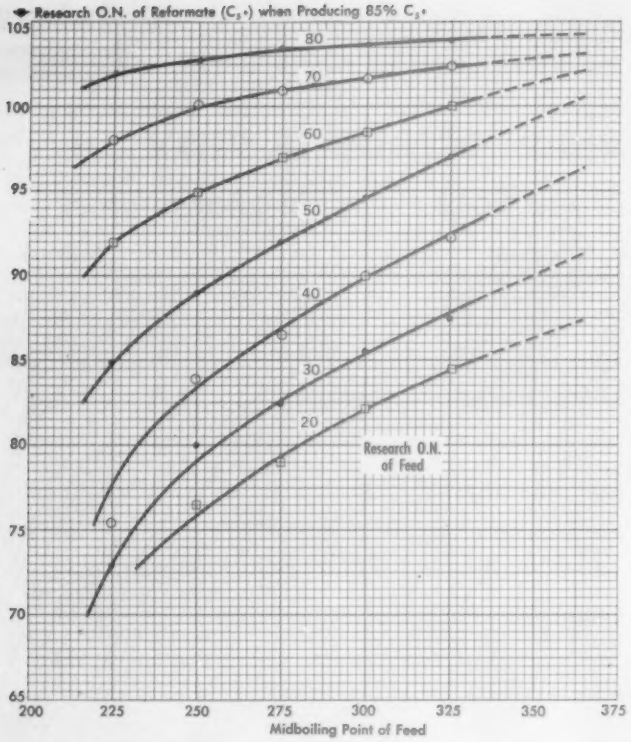
Feed properties		Yield, % debutanized reformate
Mid b.p. °F.	Research Oct. No.	
225	55	71.5
225	70	83
225	80	87
250	50	71.5
250	70	85
250	80	88.5
275	50	75
275	70	86
275	90	93
300	50	78.5
300	70	87.5
300	90	94
325	60	85
325	80	92
325	90	95



CATALYTIC REFORMING YIELD as affected by midboiling point of feed, and its octane number. Fig. 1.



CATALYTIC REFORMING YIELD as a function of octane numbers of the feed and product, and the boiling point of the feed (300° and 325° F.). Fig. 2.



EFFECT OF BOILING POINT on reformate octane number, when producing 85% of C_5 reformate. Fig. 3.

reformers can easily produce large yields of 100-octane gasoline. Yields, when producing 100-clear-research octane-number reformates from several feed stocks are shown in Table 1.

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History of soaking factor

STATEMENT: Walter E. Lobo, consulting chemical engineer, was the originator of the soaking-factor concept and he comments as follows regarding the Questions on Technology answer entitled, "Soaking Factor Applied to Viscosity Breaking," March 14, 1960, p. 189. The comments are most welcome because nothing of significance is available in the technical literature on this important subject.

"As I think I told you at the time (1945), I was the originator of the soaking-factor concept, the first formal report on the subject having been written by me and presented at the cracking development committee meeting in June 1933. The first work was done on the cracking of Mid-Continent gas oil, and the useful approach was then applied to the cracking of other gas oils, both single-pass and recycling, and then to viscosity breaking and naphtha reforming. In fact, correlations were developed later which permitted the estimation of the required soaking-volume factor for a given conversion or crack per pass, or octane improvement in the case of reforming, when the characteristics of the furnace charge were known.

"As a matter of fact, the method was applied at first only to liquids, although the operating conditions might be such that all or part of the fluid was in the vapor state. The correlations involved the use of proper correction factors for pressure in the case of cracking all stocks, and did not make use of any compressibility factor.

"It was only later that the soaking-factor method was applied to thermal polymerization where the charge stock was the normally gaseous hydrocarbons. During the war the method was somewhat modified and placed on a more rigorous, although probably no more accurate, molal basis.

"Referring to page 674 of the fourth edition of your book, 'Petroleum Refinery Engineering,' I find the statement that it (the soaking factor) 'is of little use in the design of stills.' This is quite contrary to the fact as that is where its greatest use exists and where it has proved itself to be the only method for design when no pilot-plant data are available. Even then, it serves as the tool for transposing the small-scale data to commercial design practice. Just because all the correlation charts are not available to the general public does not mean that the tool is not a powerful one.

"To refer again to your discussion in the recent issue, although the soaking factor is, of course, empirical there have been developed mathematical ways to predict maximum yields and in the case of gas-oil cracking, to predict a maximum crack per pass. Experience has shown that although this maximum can actually be achieved in practice under certain conditions, or for short periods of time, coke-free operation will only be obtained by keeping under a certain percentage of this maximum crack per pass."

32. How to find original oil in place by the volumetric method

BY E. T. GUERRERO
and
F. M. STEWART

GIVEN: Electric and MicroLog data on lower Strawn sand from wells drilled in Northwest Trimue field, Tillman County, Oklahoma, Table 1. Other data are as follows:

ϕ = average porosity, thickness weighted = 15.9%.

S_w = average interstitial water saturation from electric and contact logs = 23.0% of pore volume.

B_{oi} = initial formation volume factor = 1.56.

K = planimeter constant = 1.0.

REQUIRED:

1. Draw an isopach map and find net sand volume by trapezoidal rule and square pick methods.

2. Draw an isovol map and find pore volume by trapezoidal rule method.

3. Compute initial oil in place using the results of (1) and (2).

METHOD OF SOLUTION: These equations will be used in the solution of the problem.

Trapezoidal rule:

$$V_s = K\{I[(A_o/2) + A_1 + A_2 + \ldots + A_n - 1 + (A_n/2)] + h_n A_n\} \quad (1)$$

Square pick method:

$$V_s = \sum_{i=1}^{i=n} A_{si}\, h_{si} \quad (2)$$

Initial oil in place:

$$N = \frac{7{,}758\, V_s \phi\, (1 - S_w)}{B_{oi}} \quad (3)$$

$$N = \frac{7{,}758\, (P.V.)\, (1 - S_w)}{B_{oi}} \quad (4)$$

Where:

V_s = net sand volume, acre-ft.

I = Isopach interval, ft., or isovol interval, porosity-ft.

A_o = area enclosed by zero contour line, acres.

$A_{1, 2, etc.}$ = area enclosed by each successive contour line above the zero line, acres.

h_n = average net sand thickness above maximum contour line, ft.

A_n = area enclosed by maximum thickness contour line, acres.

A_{si} = net sand area covered by square i, acres.

h_{si} = average net sand thickness in sand area covered by square i, ft.

N = initial oil in place, stock-tank bbl.

ϕ, S_w, B_{oi}, and K were defined with data.

P.V. = pore volume, acre-ft.

TABLE 1—LEASE, ELECTRIC AND CONTACT LOG DATA, LOWER STRAWN SAND, NORTHWEST TRIMUE FIELD, TILLMAN COUNTY, OKLA.

Operator and Lease	(1) Well No.	(2) Subsea elev., ft. Top	(3) Subsea elev., ft. Base	(4) Gross thickness, ft.	(5) h, ft.*	(6) Porosity fraction†	(7) h × φ (6) × (7)
Sunray Mid-Continent							
B. J. Alexander	1	−3,762	....	....	0	....	....
	2	−3,783	−3,793	10	2	0.170	0.34
D. D. Alexander	1	−3,770	−3,778	8	6	0.180	1.08
	2	−3,814	−3,842	28	28	0.185	5.18
	3	−3,750	−3,764	14	13	0.140	1.82
	4	−3,793	−3,822	29	29	0.185	5.37
Copeland-Ray	1	−3,722	....	....	0	....	....
	2	−3,838	−3,865	27	27	0.172	4.64
	3	−3,866	....	....	0	....	....
	4	−3,833	−3,843	10	0	....	....
Kadane & Sons							
Parris "B"	1	−3,807	−3,825	18	18	0.165	2.97
	2	−3,890	−3,911	21	20	0.220	4.40
	3	−3,830	−3,861	31	31	0.160	4.96
	4	−3,949	−3,957	8	0	....	....
Ray	1	−3,743	−3,765	20	20	0.085	1.70
	2	−3,828	−3,851	23	23	0.160	3.68
	3	−3,853	−3,875	22	22	0.135	2.97
	4	−3,956	....	....	0	....	....
C. P. Burton							
Amyx	1	−3,804	−3,810	6	6	0.120	0.72
S. D. Johnson							
Watson	1	−3,818	−3,826	8	0	....	....

*Net oil-sand thickness from contact logs. †From log data.

SOLUTION:

Net sand thickness values, Column 5, Table 1, were recorded on wells within respective leases of a property map. Isopach lines connecting points of equal net thickness were drawn (interval = 5 ft.) to get Fig. 1. This map was then planimetered, by leases, to give the data in Columns 1 through 10, Table 2. Column 13 is a solution of Equation 1 for each lease. For example, using the data for the D. D. Alexander lease

$$V_s = 1.0\{5[(80.8/2) + 72.0 + 58.3 + 43.4 + 28.8 + 16.5 + (4.9/2)] + 1 \times 4.9\}$$

$$= (5)\,(261.9) + 4.9$$

$$= 1{,}314 \text{ acre-ft.}$$

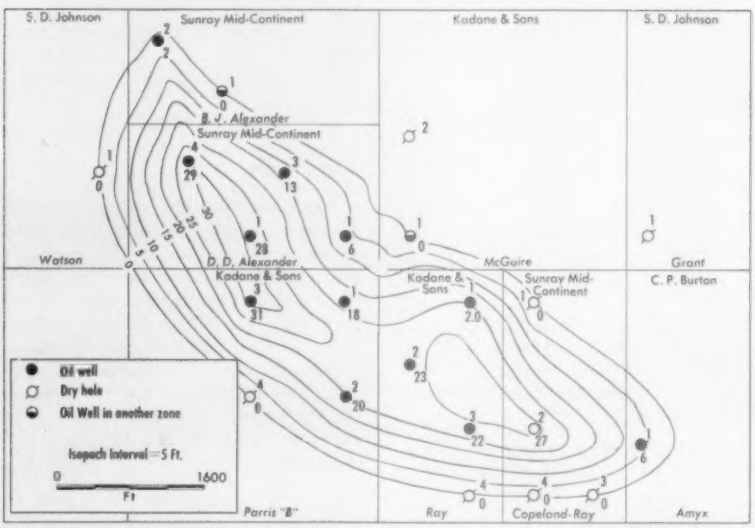
Summation of the individual lease volumes gave a pool net sand volume of 4,641 acre-ft.

Leases involved in this pool are bounded by north-south and east-west lines. The middle portion is Sec. 3, 3-3s-19w, Tillman County, Oklahoma. On transparent paper Sec. 3, which contains 640 acres, was divided into sixty-four 10-acre squares and the eastern part of Sec. 2 (west of Sec. 3) and western part of Sec. 4 were also divided into 10-acre squares. This overlay was placed over the isopach map, Fig. 1, and net sand and average thickness recorded for each square that covered a portion of the pool.

Only area covering productive sand volume was recorded. The product of

TABLE 2—PLANIMETER DATA FOR LEASE AND POOL NET SAND VOLUME DETERMINATIONS, NORTHWEST TRIMUE FIELD, TILLMAN COUNTY, OKLAHOMA

	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)	(11)	(12)	(13)
	Areas Enclosed by respective isopach lines, acres										Avg. thickness above max. ft. isopach	Volume above max. ac. ft. isopach	Net sand volume, ac. ft. (10)×5+(12)
Operator and Lease	0 ft.	½×(1)	5 ft.	10 ft.	15 ft.	20 ft.	25 ft.	30 ft.	½ × Last area	Total			
Sunray Mid-Continent													
B. J. Alexander	17.3	8.7	9.2	3.9	1.0	0.1	...	...	0.1	22.9	...	...	115
D. D. Alexander	80.8	40.4	72.0	58.3	43.4	28.8	16.5	4.9	2.5	261.9	1	4.9	1,314
Copeland-Ray	52.5	26.3	41.0	29.5	16.9	8.3	2.3	...	1.2	123.2	1	2.3	618
Kadane & Sons													
Parris "B"	79.1	39.6	67.1	55.3	44.4	30.2	10.2	2.6	1.3	248.1	1	2.6	1,243
Ray	70.4	35.2	63.5	57.5	48.0	36.1	14.3	...	7.2	247.5	1	14.3	1,252
McGuire	8.3	4.2	2.8	...	...	...	...	...	1.4	5.6	2	5.6	34
C. P. Burton													
Amyx	9.4	4.7	2.6	...	...	...	...	...	1.3	6.0	2	5.2	35
S. D. Johnson													
Watson	8.8	4.4	2.3	...	...	...	...	...	1.2	5.6	1	2.3	30
Field total	....	....	....	....	....	....	....	....	....	....	....	....	4,641



NET SAND-THICKNESS VALUES from Table 1 were used in preparing this isopachous map of the lower Strawn sand, Northwest Trimue field, Oklahoma. Fig. 1.

net sand area and average thickness recorded for a square gives net sand volume covered by the square. Summation of all such products for squares in a lease gives the lease net sand volume (Equation 2). For example, in the D. D. Alexander lease:

$$V_s = (2)(15) + (2)(13) + (1)(3) + (10)(18) + (10)(24) + (10)(12) + (5)(4) + (10)(13) + (10)(27) + (10)(20) + (10)(7)$$

$$= 30 + 26 + 3 + 180 + 240 + 120 + 20 + 130 + 270 + 200 + 70$$

$$= 1{,}289 \text{ acre-ft.}$$

Table 3 shows net sand volumes for all leases and a field total of 4,590 acre-ft.

Column 6 of Table 1 shows the average porosities found for respective wells using core data, electrical survey and contact log data. The value for a well was multiplied by the well's net sand thickness to give the data of Column 7, Table 1. This gives net sand thickness in porosity-feet. These values were recorded on a base map and isovol lines (lines connecting points of equal porosity-feet) drawn. The resulting isovol map is Fig. 3. Areas enclosed by contours on this map were planimetered and recorded in Table 4. Pore volume was computed using these data and Equation 1:

$$P.V. = 1.0\{1.0[(325/2) + 247 + 176 + 113 + 45 + (9/2)] + 0.2 \times 9\}$$

$$= 162.5 + 247 + 176 + 113 + 45 + 4.5 + 1.8$$

$$= 750 \text{ acre-ft}$$

Using Equation 3 and the pool net sand volume from Table 2

$$N = \frac{(7{,}758)(4{,}641)(0.159)(1.00-0.23)}{1.56}$$

$$= 2{,}825{,}700 \text{ st. tk. bbl.}$$

Or using Equation 4

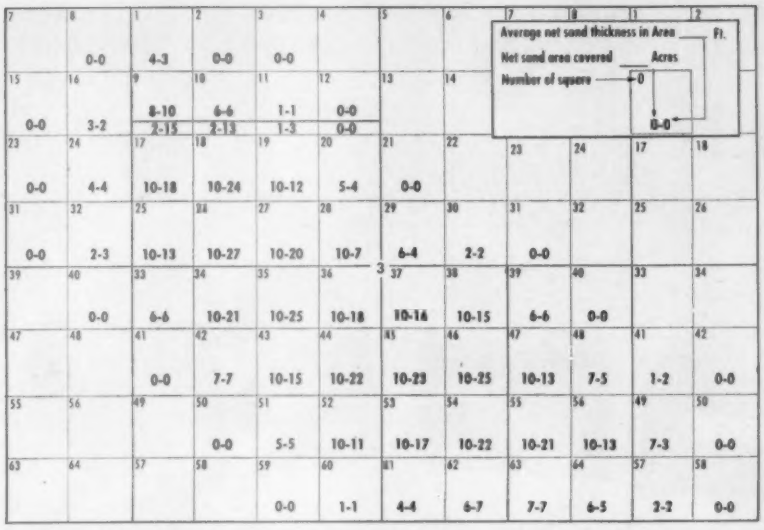
$$N = \frac{(7{,}758)(750)(1.00-0.23)}{1.56}$$

$$= 2{,}871{,}950 \text{ st. tk. bbl.}$$

DISCUSSION: This problem is an example of one of the oldest and most-used methods of finding initial oil in place. It is normally referred to as the volumetric or pore-volume method. Included in its solution are rock and fluid properties and net sand volume data. The final solution of volumetric-type formulas (Equations 3 and 4) is simple. But a lot of work and engineering judgment are needed in arriving at values of porosity, oil saturation, initial formation-volume factor, and net sand volume. Determination of average porosity, initial oil saturation ($1-S_w$), and initial formation-volume factor for a lease or reservoir have been covered in previous articles.[1 2 3]

In finding net sand volume of a lease or pool we must first define the limits. This is done with log and core-analysis information. We can find depth to the top and base of net sand, and amount of gross productive interval.

From such data cross-sections and maps can be drawn to define structure. From logs, drill-stem tests, core analyses, and well-completion data, the outer limits (pinchout or oil-water contact) can be defined. When a gas



AN OVERLAY OF THIS TYPE, on transparent paper, is used to record the net sand and average thickness of each 10-acre tract in the field. Fig. 2.

cap exists initially, we must establish the gas-oil contact using core analyses or drill-stem and production test data. Objective is to find the area and vertical limits within which lies oil-productive net sand.

Once this is done maps such as those in Figs. 1 and 3 can be drawn and sand volume found by one or more of the procedures shown in this problem.

In the volumetric formula, net sand volume is perhaps the least reliable factor. Thus considerable care should be used in its determination. Best results are obtained when use is made of all information available.

It should be possible to establish a net sand thickness for every well. The portion of gross interval which is productive is usually best obtained from core analyses data but fairly reliable values may also be obtained from contact, self potential, and other types of log data. Where more than one type of data are available, all types should be used and the results compared.

Several methods can be used to find net volume from isopach maps.[4] Two of the most common were used in this problem and results show they give comparable values. Planimetering is preferred by many, but the use of square picks is faster when we want to know individual lease volumes in addition to pool volume. It is also more adaptable for machine data processing. In those portions of the country where the range-township-section system of surveying is used, it is possible to develop clear-film or other transparent overlays containing known area squares covering one or more sections for use on isopach maps of a given scale.

Table 3—Lease and Field Net Sand Volumes (Square Pick Method) Northwest Trimue Field, Tillman County, Oklahoma

Operation and Lease	Net sand, ac.-ft.*
Sunray Mid-Continent	
B. J. Alexander	129
D. D. Alexander	1,289
Copeland-Ray	620
Kadane & Sons	
Parris "B"	1,231
Ray	1,238
McGuire	28
C. P. Burton	
Amyx	27
S. D. Johnson	
Watson	28
Field total	4,590

*Summation net sand volumes of squares in lease.

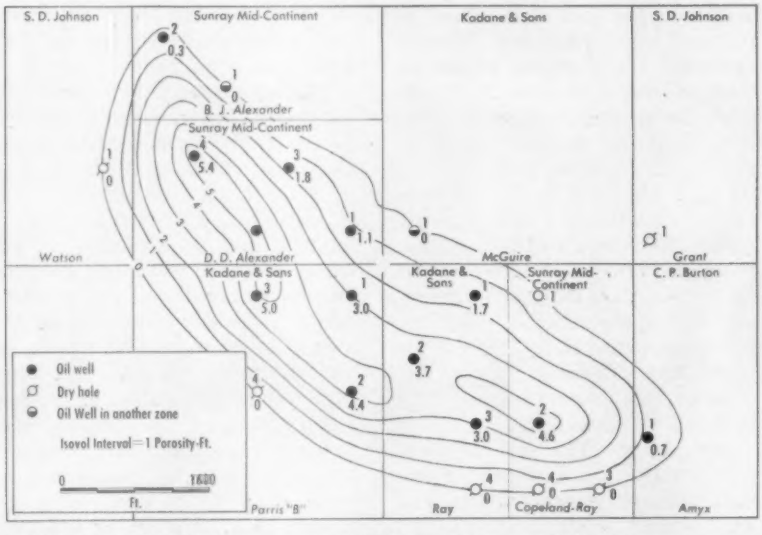
Table 4—Data from Isovol Map for P.V. Determination, NW Trimue Field, Tillman County, Oklahoma

Contour	Area enclosed by isovol, acres
0	325
1	247
2	176
3	113
4	45
5	9

$h_n = 0.20$ porosity ft.

Fig. 3 shows another type of map that can be used for getting initial oil in place, the isovol map. It consists of isovol lines connecting points of equal porosity-feet. The volume from it is the pore volume of the pool (or lease) or the product of $V_a\phi$ in Equation 3. It has the advantage that average well porosities are volumetrically weighed in the process of pore-volume determination.

A further step is the development of a map giving the product of $V_a\phi(1-S_w)$ in Equation 3. By connecting points of equal hydrocarbon pore space the result is an isohydrocarbon or "isocarb" map.



PRODUCT OF POROSITY and net sand thickness (Column 7, Table 1) were used in preparing this isovol map. Lines are drawn through points of equal porosity-feet. Fig. 3.

References

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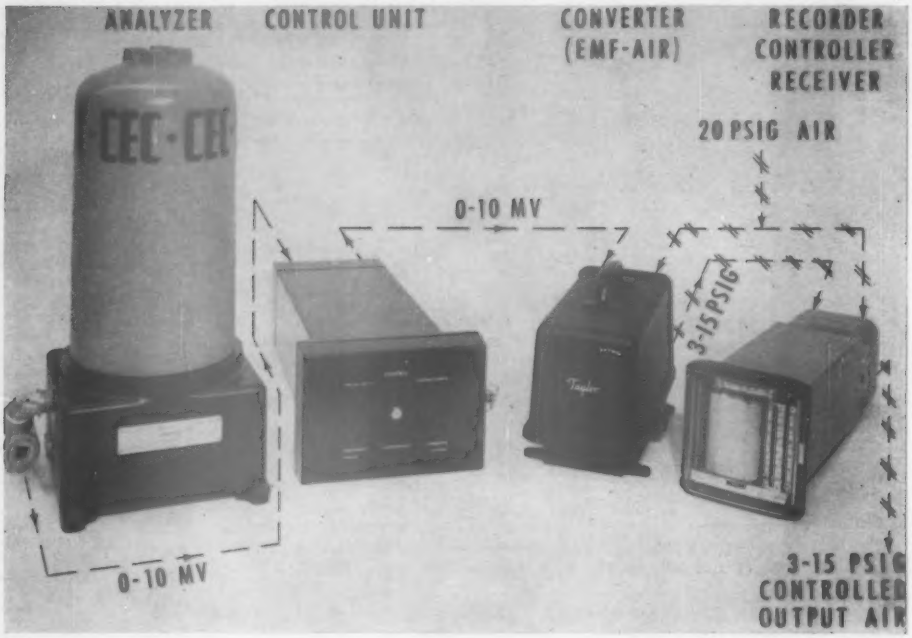
3. Guerrero, E. T., and Stewart, F. M., Problem XXXVI.
4. Vance, Harold, Petroleum Subsurface Engineering, Educational Publishers, Inc., 1950, Chapter 8.

BY JIM ZIKE
Reef Corp.



A PROCESS chromatograph was selected to control the deethanizer so that the propane product would have a maximum amount of ethane and still meet commercial specifications. Fig. 1.

Process chromatograph controls

A PROCESS chromatograph has been controlling ethane content of the deethanizer bottom product at Reef Corp.'s Big Spring, Tex., plant for more than a year. The instrument has exhibited very high reliability and accuracy, and has maintained a maximum propane vapor pressure fluctuation of 7 psi.

The decision to install the instrument was based on the increase in propane production that could be obtained by leaving more ethane in the product without exceeding commercial vapor-pressure specifications. On this basis, it is estimated that the installation paid out in 6 months.

Operation. The deethanizer operates at 530 psi. with top and bottom temperatures of 72 and 230° F., respectively. A schematic flow diagram is shown. Feed to the column enters through a preheater which maintains temperature of 160° F. Reboiler heat is supplied by controlled quantities of steam. The overhead product is partially condensed at 530 psi. and 40° F., with condensed liquid being returned to the column as reflux. Pressure is maintained by a controller on the uncondensed portion of the column overhead product.

The chromatograph was placed in the temperature control loop which varies heat input to the reboiler. A sample is taken ahead of the liquid-level control valve on the bottoms out of the deethanizer and analyzed. The per cent ethane is recorded on a controller. The relationship of the ethane content to the controller's set point then positions the set-point indicator of the temperature recorder-controller (TRC) pneumatically to compensate for drift. The TRC in turn pneumatically resets the flow indicator-controller (FIC) which in turn adjusts the stream flow by operating a flow-control valve on the steam condensate out of the reboiler. The control temperature is taken from the fourth tray off the bottom of the column. This location was found to be best for our operation.

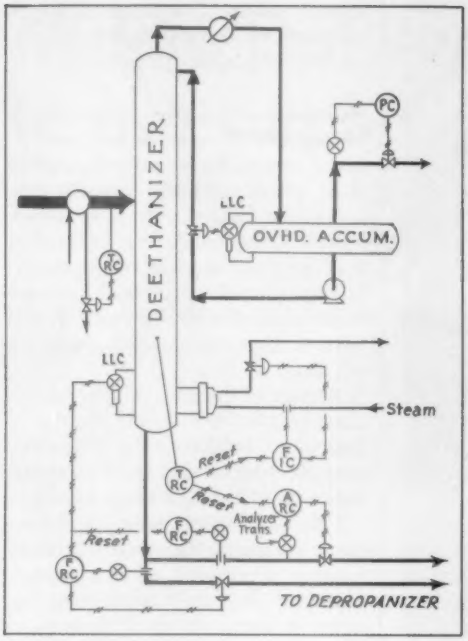
Note that the TRC was not omitted but rather was incorporated into the cascaded instrument system. The TRC is used for stabilization of the process so that abrupt changes in ethane content will not upset the column operation and it permits the operator to visually observe changes in column operation. It also serves to limit the range through which corrections can be made and is a safeguard against over-control due to malfunction of equipment.

Since this instrument was installed an average propane vapor pressure of 209.5 psi has been produced with a maximum and minimum of 207 and 214 psi., respectively.

The equipment selected for this job was a Consolidated Electrodynamics Corp. recording-controlling chromatograph and a Taylor Instrument Co. "peak-picking" device. It will analyze three streams for a total of four components, one of which is incorporated into the closed-loop control system. In addition to automatic control of the deethanizer bottom product, it records for monitoring purposes the propane content of the absorber residue gas stream, and the isobutane and isopentane content of the normal butane stream. One sample is analyzed every 15 minutes on a sequence basis, or it can be repeated if desired.

These other two stream analyses

Presented at CNGA meeting, Los Angeles.



DEETHANIZER FEED is made up of three separate streams of varying rates and compositions. Tray - temperature control allowed propane vapor pressure to vary from 190 to 225 psi. Fig. 2.

deethanizer operation

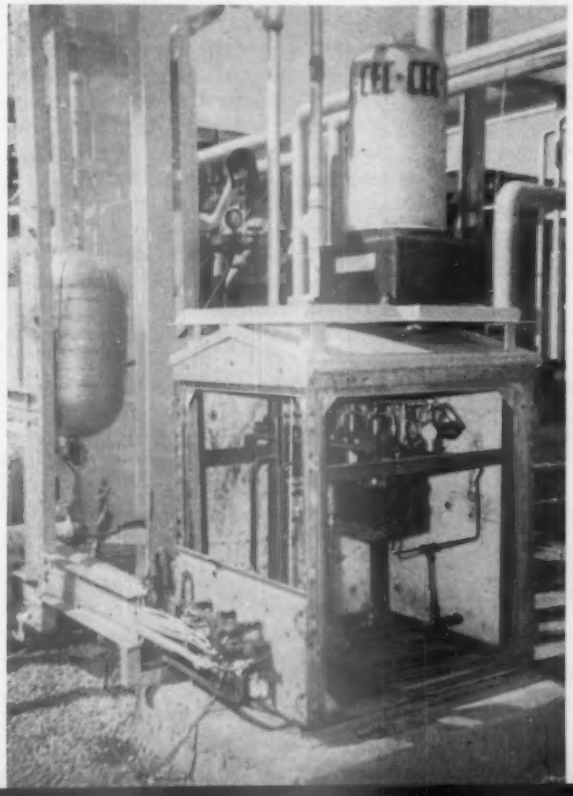
Instrument pays off in 6 months and gives smoother plant operation as a bonus.

might be called bonuses because the control loop was our primary interest. Nevertheless, monitoring of the other streams has proved to be a very valuable tool in the control of the plant.

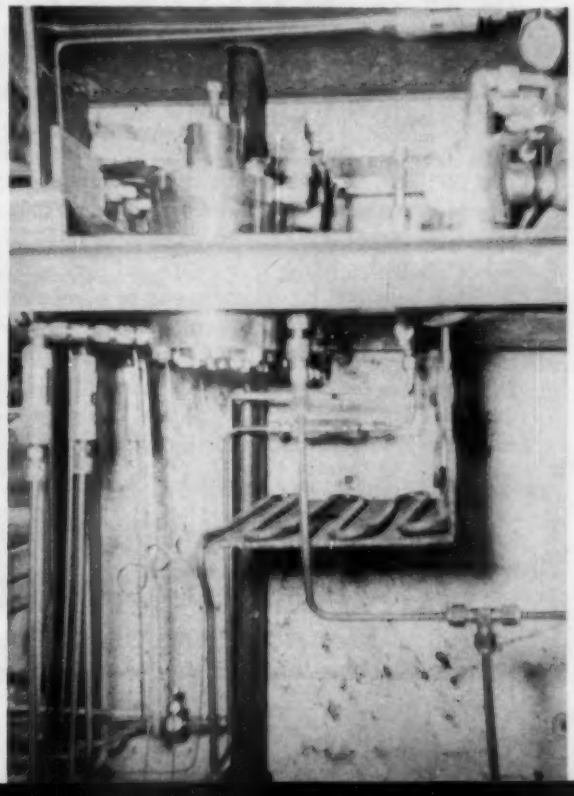
Fig. 1 is a pictorial assembly of the component parts of the analyzer-recorder controller illustrating the flow pattern. The sample enters the analyzer where it passes through the partioning column. An output signal relative to the content of each component analyzed is conducted from the analyzer to the control unit where it is programed. Preselected peaks of proper attentuation are then conducted to the converter where the electrical signal is converted to a pneumatic signal. This in turn is recorded by the receiver-recorder controller. The output of the controller is then fed to the cascaded control system.

Fig. 3 is a view of the analyzer which is centrally located to permit convenient access to the streams which are sampled. Notice that the analyzer is mounted on top of a box (normally closed) that is insulated and steam heated so that each sample entering is completely vaporized. Upon close inspection of Fig. 4, you can see the purge piping, vaporizer regulators, and solenoid

ANALYZER is mounted on top of an insulated, steam-heated box containing the sampling apparatus and piping. Fig. 3.



CLOSE-UP VIEW of sampling apparatus showing purge piping, vaporizer regulators, and solenoid valves. Fig. 4.



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sample valves. The purge piping is essential for maintaining fresh sample with a minimum of time lag.

Reliability. You may question the advisability of using such a complicated device for a natural-gasoline plant where technically trained personnel are limited. We have found, however, that since the instrument was installed, services of the manufacturer's service personnel have not been required. Once or twice we did utter a disparaging word. Even so, we fixed it.

Service of the unit, in general, excluding our bonehead errors, is limited to balancing the automatic zero mechanism and calibrating the unit with a standard sample weekly.

Our experience with the instrument indicates that cost of maintenance is nominal, and the repeatability of analysis is better than that of laboratory analysis. This is especially true of the control stream, the composition of which consists of ethane through nonanes.

It is not possible to apply a dollar value to the increase in product recovery offered by monitoring the two additional streams; however, there are some benefits we do enjoy:

1. Detection of abnormal losses of product in residue gas caused by unnoticed or supposedly inconsequential changes in operation.
2. Detection of an off specification product before it can be found by periodic laboratory checks. Time and rate of change can be noted for better diagnosis of trouble.
3. The operator is relieved from routine testing so that he can put his time to more profitable jobs.
4. Savings in utilities (steam, power, fuel, and cooling) used to possibly overdrive a column.

The decision to buy and install the instrument at this plant was based on the expected increase in commercial propane production which would occur as a result of leaving a maximum amount of ethane in the propane. It is estimated that the equipment paid out in six months.

Acknowledgment

Appreciation is expressed for the assistance of personnel of Reef Corp. and Consolidated Electrodynamics Corp. in preparing this paper.

Middle East seeks ways to use surplus gas

• Despite a somewhat unfavorable industrial climate, recent studies indicate that the Middle East may hold a bright future for certain gas-consuming industries.

THE MIDDLE EAST has a big surplus of associated gas. A lack of ready markets for this valuable product dictates that almost 70% of it be released through flares and burned.

About 25% of this gas, produced in conjunction with crude, is reinjected to help maintain reservoir pressures. This practice also saves the gas for use at some later date when there may be a better market for it. Another 8% is used to provide energy, mostly as a fuel, for the producing companies.

Papers presented by A. C. C. Hill and E. P. Zinola, Arabian American Oil Co., and W. C. Renton and B. R. R. Butler, Kuwait Oil Co., Ltd., at the Second Arab Petroleum Congress point out what is being done and can be done in Saudi Arabia and Kuwait to effectively use more of this surplus gas.

An estimated 750 M.M.c.f.d. of associated gas will be produced in this country during 1961. Of this amount, Arabian American Oil Co. (Aramco) is expected to use 90 M.M.c.f.d. for producing energy, 405 M.M.c.f.d. for direct injection, and 55 M.M.c.f.d for LPG injection. This leaves a surplus of 200 M.M.c.f.d. for industrial use that will be available at prices ranging between 5 and 6½ cents per million B.t.u.

Several companies have made studies of the feasibility of establishing industries in Saudi Arabia that would use large quantities of gas. But each time the studies ended up with the conclusion that the plants would be too far from the usual markets, and that construction and operation costs were too high.

Last year, Aramco employed the Deutsche Project Union (DPU), a German engineering firm, to make a study of the uses to which this surplus gas could be put. DPU came up with a plan, the first step of which was the construction of a large power plant to provide cheap electrical power for new industries. The plan next calls for establishing facilities to make products that are presently imported, such as cement, lime, gypsum, lye, glass, and chlorine; and an iron foundry. And the final step provides for producing products for export, such as fertilizer and carbon black.

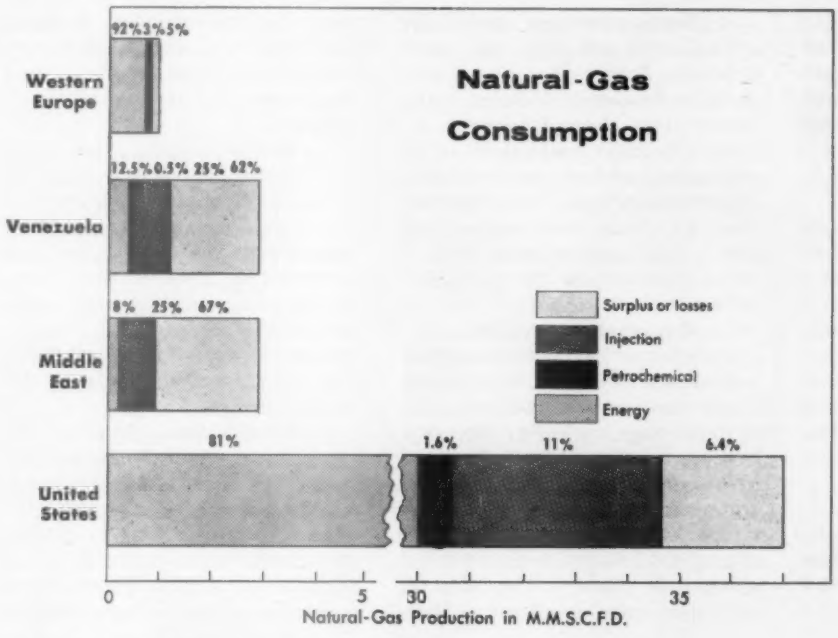
On the basis of this report, the establishment of certain industrial plants in Saudi Arabia to use associated gas should be attractive. The degree of attractiveness will depend on the extent to which costs can be met and markets developed. And of equal importance with costs and markets is the industrial climate which manufacturers may experience in Saudi Arabia.

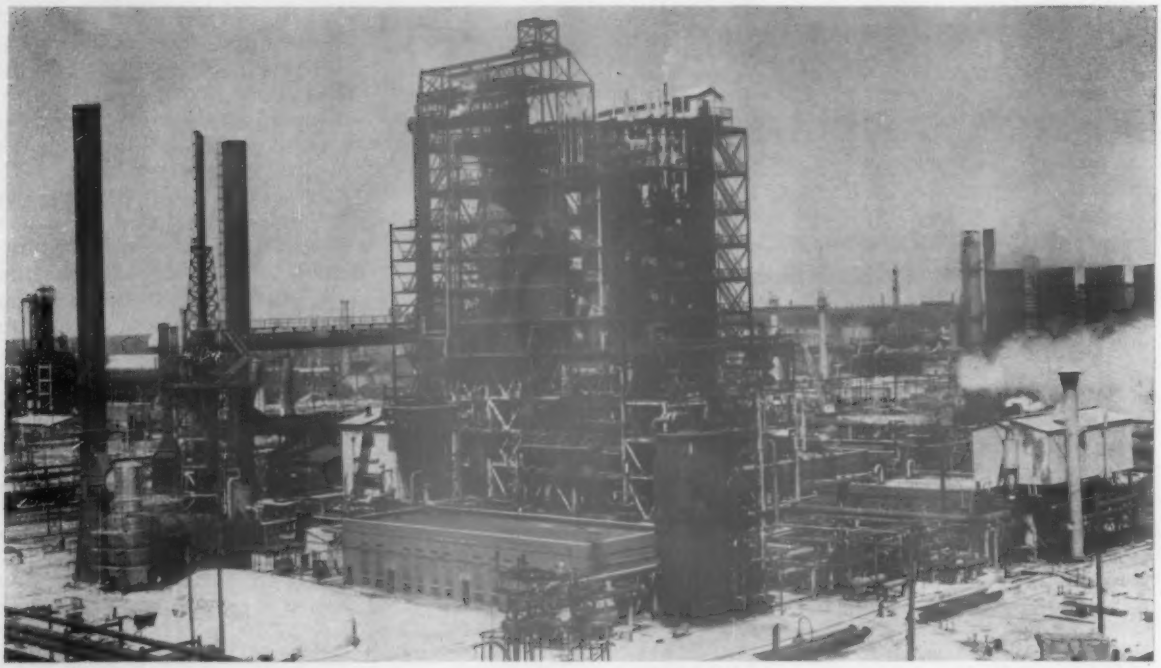
Probably a larger percentage of the associated gas produced in Kuwait goes into energy than in Saudi Arabia because of the necessity of operating huge seawater distillation plants to supply fresh-water requirements. Kuwait Oil Co., Ltd., operates a 2-million-gallon per day water-distillation plant and the Kuwait Government's plant has a capacity of 6 million gallons per day.

Kuwait Oil consumes the lion's share of this country's gas production. Its usage breaks down something like this: Reservoir injection accounts for 100 M.M.c.f.d.; another 80 M.M.c.f.d. goes to fuel; and more than 25 M.M.c.f.d. is converted into LPG.

The Kuwait Government uses about 30 M.M.c.f.d. for energy and heating. This consumption is expected to increase to 55 M.M.c.f.d. during the next 10 years.

A newly completed brick factory uses gas to fire its kilns, and other gas-using industries are in various stages of investigation and construction.





FACED WITH A NEED for more cracking capacity, American Oil Co. decided to modify an old FCC unit, rather than build a new one. Fig. 1.

Revamping cat cracker pays off for

ALTHOUGH a new FCC unit would have improved yields, lowered operating costs, and would have eliminated down time, the decision to modify the old unit has paid off.

The new design has boosted feed rate from 40,000 to 45,000 bbl. per stream day at a recycle rate of 16,000 bbl. per stream day of heavy cycle gas oil. Coke-burning capacity has increased from 25,000 to 44,000 lb. per hour.

The modified unit is part of an over-all modernization program at Whiting. Additions have included a new crude - oil - distillation unit; a second vacuum tower on a crude pipe still; a new vapor-recovery unit; modifications to a combination crude, coking, and cracking unit; as well as expansion of two fluid catalytic cracking units and their related vapor-recovery facilities.

Engineering was provided by M. W. Kellogg Co., while field construction was handled by Whiting's mechanical department. Major

BY C. T. NICHOLSON AND F. J. CITEK
American Oil Co., Whiting, Ind.

revisions and equipment additions included:

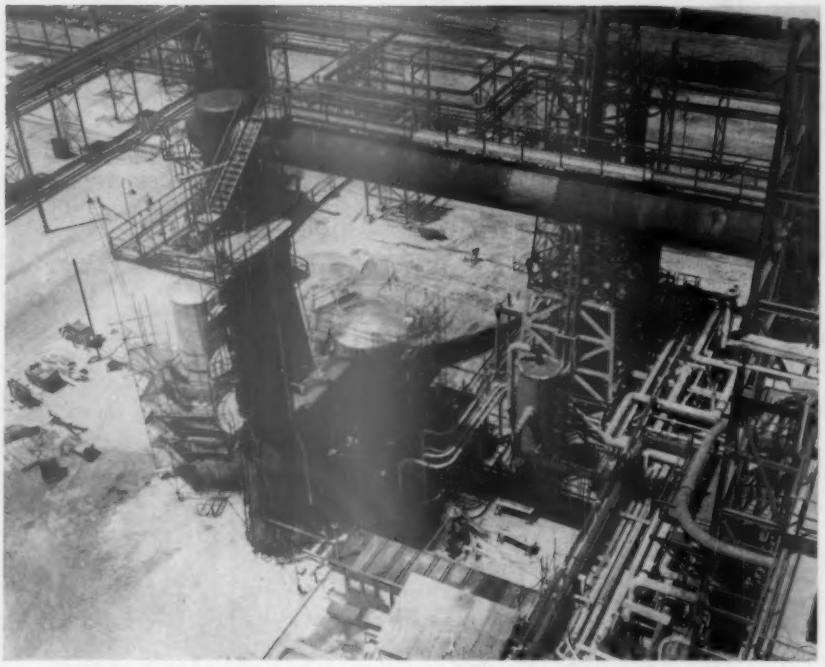
... Regenerator vent stack. The original stack and slide valve were removed. They were replaced with an 80-in. lined duct extending to the battery limits (Fig. 2) and an expansion chamber with a double-disk slide valve and four pressure-reducing orifices. A bypass stack was provided for a waste-heat-recovery unit now under construction. Fig. 3 shows location of the equipment within the unit.

... Regenerator cyclones. The regenerator was originally equipped with six sets of three-stage cyclones. These were replaced with nine sets of three-stage cyclones. The diplegs were enlarged and those on the second and third stages were equipped with trickle valves. A cyclone quench-steam system was provided to supply a controlled quantity of steam to the outlet of each first-stage cyclone. Thermocouples were installed in the third-stage outlets of all nine cyclone sets to indicate afterburn.

... Reactor cyclones. Two-stage cyclones were retained in the reactor, but the total was increased from 8 to 18. Cyclone diplegs were enlarged and those on the second stage were equipped with trickle valves.

... Reactor stripper. Design catalyst-circulation rate was increased to 50 tons per minute. This required a larger, completely segregated stripper with the catalyst feed rate controlled by an internal slide valve. Stripping steam and stripped hydrocarbon vapors leave the stripper through four vent pipes which extend to the elevation of the reactor cyclone inlets.

... Catalyst lines. New catalyst piping was designed for both higher circulation rates and more severe temperatures and pressures. The regenerated and spent-catalyst standpipes were enlarged to 25 in. i.d. The original 20-in. slide valves were retained but were modified in



ORIGINAL STACK and slide valve were replaced with an 80-in. lined duct, and an expansion chamber with a double-disk slide valve and four pressure-reducing orifices. Fig. 2.

American Oil Co.

Down time of 113 days was expensive, but less costly than a new unit. Modifications boosted fresh feed capacity from 40,000 to 45,000 bbl. per day.

order to increase their port area.

The size of the two reactor feed lines was increased to 36 in. i.d. and they were lined with refractory. The size of the two spent-catalyst carrier lines was increased to 35 in. i.d.

... New air blower. A second air blower was installed adjacent to the battery limits (Fig. 4). This blower, driven by a six-stage, 100-psig. steam turbine, develops 10,360 hp. to deliver 83,200 c.f.m. of carrier air, primarily to the spent-catalyst and recycle-catalyst carrier lines. Surplus air spills into the combustion-air header, which is also common to the discharge piping from the original air blower.

... New gas compressor. A centrifugal gas compressor was installed to handle all wet-gas production. The gas-compressor turbine, which is driven by 400-psig. steam, exhausts into a surface condenser that also serves the new air blower. The compressor delivers wet gas at 205 psig. discharge pressure to the vapor-recovery units.

... Fractionator. Several changes were made to the fractionator and its associated equipment to remove bottlenecks.

Baffles were replaced in the lower portion of the tower. Reflux duty of this section was increased by providing a new slurry reflux circuit, including two slurry pumps, two slurry - fresh feed exchangers, and a kettle-type slurry cooler which generates 160-psig. steam.

Slight modifications permitted tray capacity in certain other critical sections of the tower to be increased.

The intermediate and heavy cycle gas-oil reflux systems were modified. A new system was added for supplying sponge oil to adjacent vapor-recovery units. Rich sponge oil from the vapor-recovery units is returned to the fractionator.

Changes were made to increase the production of light cycle gas oil during the winter heating season, and to increase the quantity of heavy cycle gas oil recycled to the reactor.

Piping to the overhead condensers was modified to reduce pressure drop. Four of the eight condenser bundles were retubed with low fin tubes.

... Fresh-feed circuit. Changes were made to reduce pressure drop and permit fresh feed rates up to 60,000 bbl. per stream day. Preheat exchangers provide two parallel streams served by separate fresh-feed pumps. A new preheat circuit was added through the new slurry-oil exchanger.

Construction and reconditioning required that the unit be shut down for 113 days. However, about half the work was completed before the shutdown.

Vapor-Recovery Expansion

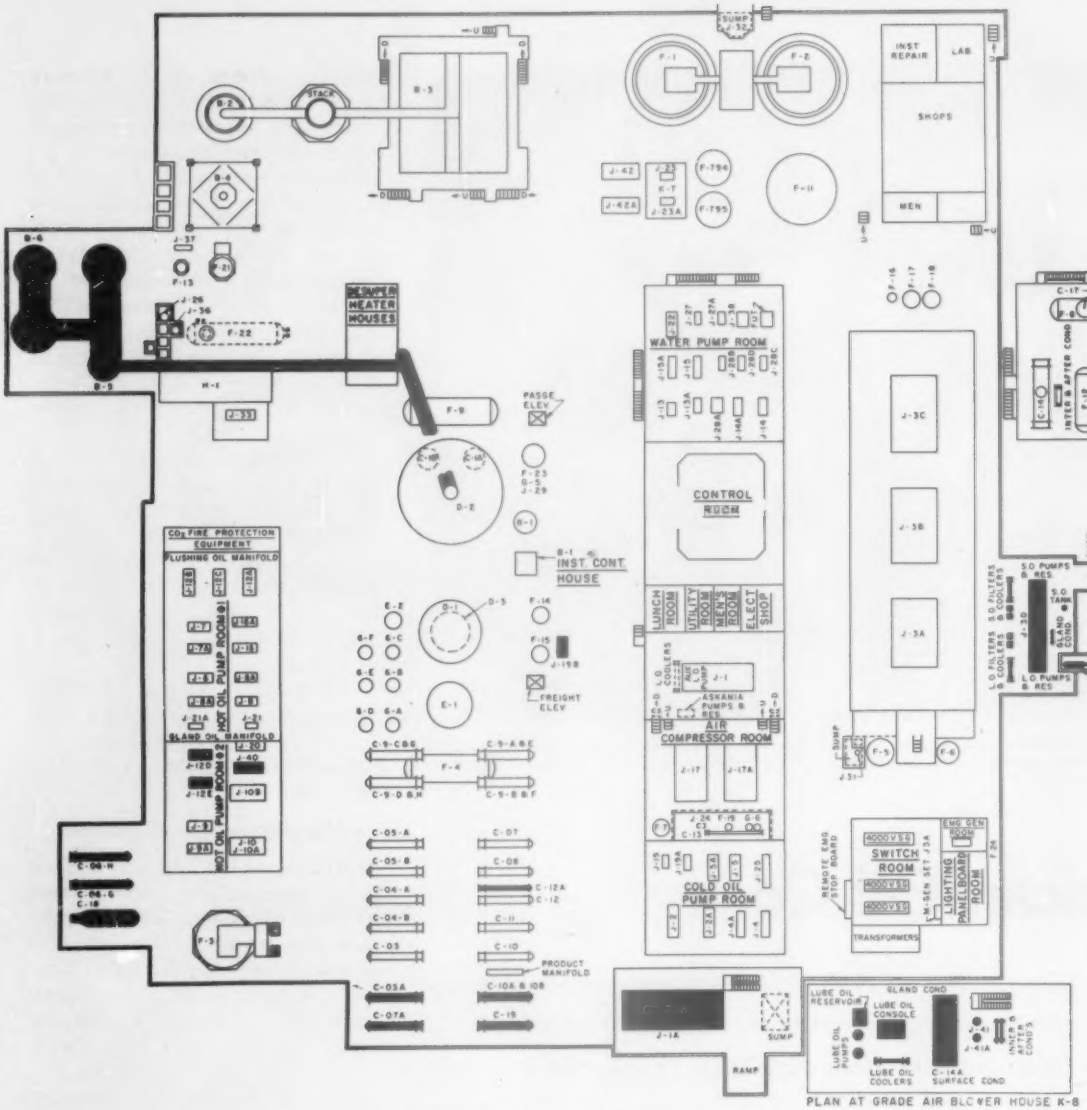
Original design and construction of the vapor-recovery unit allowed for future expansion. Consequently, lines and pumps were generally sized to handle any expanded flow. Spaces were provided in the original design for additional exchangers. Eight new exchangers were added, including six low fin-tube bundles.

Trays in the absorber, depropanizer, and lean-oil still were modified to handle the expansion. A second hydrogen sulfide absorber and amine cooler were erected adjacent to the old unit.

FCC Operation

Operation of the fluid catalyst unit has been generally satisfactory. Minor problems with the centrifugal gas compressor and the new air blower were solved within a few days. The concrete linings in the expansion chamber and in the duct leading to the bypass stack have shown some deterioration. Additions to the hydraulic oil systems left behind some dirt particles which initially fouled the pilots of the slide-valve and air-control-valve operators. Extensive filtering and replacement of oil has cleared up this system.

Operating data and yields are not



PLAN AT GRADE AIR BLOWER HOUSE K-8

PLOT PLAN shows location of equipment within unit. Areas of modification are shown in black. Fig. 3.

FURNACES & STACKS

B-1	Air heater
B-2	Steam superheater
B-3	Feed preheater
B-4	Blowdown stack
B-5	Expansion chamber
B-6	Bypass stack

EXCHANGERS

C-3	(2) Feed (T) furn. oil (S)
C-1	(2) Recycle catalyst coolers
C-4	(2) Feed (T) hvy gas oil (S)
C-5	(2) Feed (T) hvy gas-oil reflux (S)
C-6	(8) Slurry reflux (T) feed (s)
C-7	(2) Inter. reflux (s) boiler feed water (T)
C-8	Sponge oil reflux cooler
C-9	(8) Fractionator ovhd. cond.
C-10	(3) Light-cycle-oil coolers
C-11	Heavy-gas-oil cooler
C-12	(2) Decanted oil coolers
C-13	Aeration air aftercooler
C-14	J-1 blower exhaust surface condenser
C-14A	J-1A & J-3A turbine exhaust surface condenser
C-15	J-3B, J-3C, J-17 & J-17A compressor exhaust surface cond.
C-17	Boiler-feed water deaerator
C-18	Slurry steam generator
C-19	Inter. reflux cooler

VESSELS

D-1	Reactor
D-2	Regenerator
D-3	Stripper

TOWERS

E-1	Fractionator
E-2	Stripper

DRUMS

F-1	Fresh-catalyst storage
F-2	Used-catalyst storage
F-3	Slurry settler
F-4	Reflux drum
F-5	Comp. knockout drum
F-6	Comp. surge drum
F-7	Aeration air surge drum
F-8	Boiler feed water
F-9	Recycle cooler steam drum
F-11	Treated-water storage
F-12	Cond. accum.-obsolete
F-13	Phenol water drawoff drum
F-14	H.p. hydraulic oil
F-15	L.p. hydraulic oil
F-16	H.p. fuel gas
F-17	L.p. fuel gas
F-18	Refinery air surge drum
F-19	Inst. air receiver
F-21	Relief valve vent drum
F-22	Cooling-water separator
F-23	Catalyst cleanup hopper
F-24	Emergency generator gasoline storage tk.
F-26	Steam separator
F-794	Fuel-oil tank
F-795	Fuel-oil tank
G-5	Catalyst cleanup
G-6	Instrument air drier

PUMPS & COMPRESSOR

J-1	Air blower
J-1A	Air blower
J-2 & J-2A	Fresh feed
J-3A, B & C	Gas compressor
J-3D	Gas compressor
J-4 & J-4A	Fractionator reflux
J-5 & J-5A	Gasoline product
J-6 & J-6A	Intermediate reflux
J-7 & J-7A	Light-cycle gas-oil product
J-8 & J-8A	Heavy-cycle gas-oil product
J-9 & J-9A	Decanted oil product
J-10, A & B	Thickened slurry transfer
J-12, A B C D E	Slurry reflux
J-13 & 13A	J-1 air blower cond.
J-14 & 14A	J-3B & C condensate
J-15 & 15A	Boiler feed water
J-16 & 16A	Heavy-gas-oil reflux
J-17 & 17A	Aeration air
J-19, J-19A & B	Hydraulic oil
J-20	Test
J-21 & 21A	Gland oil
J-22	Fire water
J-23 & 23A	Fuel oil
J-24	Inst. air compressor
J-25	Light pumpout
J-26	Oil sump pumpout
J-27 & 27A	Treated water
J-28D	Regen. spray water
J-29	F-23 cleanup eductor
J-31	Water sump pumpout
J-32	Cat pit sump pump
J-33	Hvy slurry stop pump
J-36	Nonpressure drain sump pump
J-37	Phenol spray water
J-38	Sanitary water
J-40 & J-16A	Hot-gas-oil recycle
J-41 & 41A	J-1A & J-3D comp. condensate
J-42 & 42A	Fuel oil

BUILDINGS

K-1	Main pump and control house
K-2	J3A, J3B, & J3C Gas Comp. house
K-3	Hot-oil pump house
K-4	Utility building
K-5	Switch house
K-7	Fuel-oil pump house

NEW AIR BLOWER delivers 83,200 c.f.m. of carrier air, primarily to the spent-catalyst and recycle-catalyst carrier lines. Fig. 4.

"Product yields appear satisfactory. Gas yield is normal. Design coke yield was 7.5% at 63% conversion."

adequate to completely evaluate the performance of towers, vessels, regeneration, and stripping. However, the unit has demonstrated that it will operate satisfactorily at the new design conditions.

Maximum fresh-feed rates have been used; the unit has operated at 58,000 bbl. per day of fresh feed supplemented by 4,000 bbl. per day of heavy gas-oil recycle. Coke burning rates under these conditions are averaging 45,000 lb. per hour.

Product yields appear satisfactory. The gas yield is normal. Design coke yield was 7.5% at 63% conversion. This or a slightly lower coke yield has been realized. The new stripper is effectively removing entrained oil from the spent catalyst.

The regenerator and auxiliaries have performed well in most respects. Velocities have been maintained at 2.9 ft. per second. Catalyst losses are about 4 tons per day when velocities are maintained at this general level.

The new facilities for afterburn are quite effective. No serious problems have arisen in spite of maintaining oxygen levels up to 3% at 1,085° F. Carbon level on regenerated catalyst is 0.2%, about as expected with this surplus oxygen.

It was recognized that fractionator capacity would be tight and distillation overlap between the products from the tower was expected. However, differential-pressure instruments across four sections of the tower have made adjustments easier and have encouraged operations just below flood points.

Vapor-Recovery Unit

Operation of the associated vapor-recovery unit has also been satisfactory. There has been some compromise in the amount of lean oil circulated to the absorber to eliminate flooding. However, the rejection of butane to fuel has remained the same as that before the expansion. Further improvements are expected following the installation of a gas chromatograph for continuous analysis of these products.

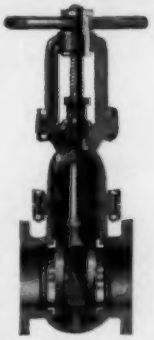
HANDLING "PROBLEM" FLUIDS OR GASES?

Specify Aluminum Gate Valves by DARLING

Where you're handling highly corrosive materials... or where valve weight is a factor... Darling Aluminum Gate Valves make sound economic sense.

High-corrosion-resistant aluminum alloys carefully selected and thoroughly tested by Darling metallurgical engineers, are used for structural and pressure-containing parts. They've been *proved-in-use* as the most generally corrosive-resistant aluminum alloys in use today.

Double disc parallel seat principle assures maximum life under the most exacting service conditions. "No pocket" discs and wedges prevent accumulation of line scale or sludge. Wedge design reduces friction to a minimum, assures positive sealing and ease of operation.



Aluminum flanged end gate valve. Also available with other types of ends. Can be furnished with inside screw stationary stem.

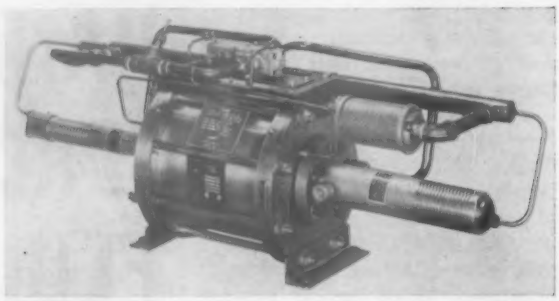
DARLING VALVE & MANUFACTURING CO.

Williamsport 1, Pa.

Manufactured in Canada by Sandilands Valve Manufacturing Co., Ltd., Galt 19, Ont.

▶▶▶ New Equipment Section

This week's SHOWCASE features . . .

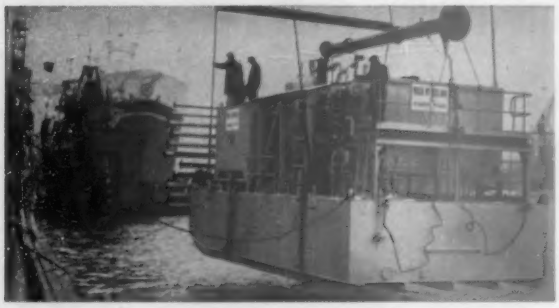


Newest gas-booster compressor

. . . driven by a plant air supply comes in single-stage sizes for compression ratios up to 6-to-1 and in two-stage sizes for compression ratios up to 16-to-1. Capacities range up to 14 c.f.m. at pressures up to 10,000 psig.

The Model AG Series compressor is designed so output capacity can be adjusted to match air-consumption rate with existing plant-air-supply systems. Driving air exhaust is used for gas inter cooling and after cooling. No cooling water is needed.

The maker claims the compressor design removes the danger involved with a lubricated compressor in the event of failure of a purification system. Source: **Haskel Engineering & Supply Co., 1236 S. Central Ave., Glendale 4, Calif., U.S.A.**



Fresh water from the sea

. . . is provided by a new vacuum-flash evaporator developed in England. It is self-contained and designed to provide 14,400 gal. a day of drinking water from sea water. An unusual feature of the evaporator is that it floats on its own pontoon.

With the aid of a winch, which forms part of the plant, the evaporator can be hauled up the beach onto a concrete foundation. Installation then requires only two operations: connection of a fuel supply and piping for the sea water. The pontoon remains part of the plant and can be used to store the fresh water produced. The maker says such self-contained plants can be built of any size which can be handled as a unit and to use any normal fuel. The plant can also be arranged to produce electric power to drive auxiliary equipment like fuel pumps, sea-water pumps, or brine-circulating pumps. Source: **Richardsons, Westgarth & Co., Ltd., 56 Victoria Street, London S.W. 1, England.**

●

Transistorized vibration monitor

. . . offers a way to protect compressors, motors, pumps, generators and similar equipment from vibration damage. The instrument works in conjunction with magnetic vibration pickups.

Two models of the monitor are obtainable: V/p-2 and V/p-T. The a.c.-operated Model V/p-2 offers a wide range of sensitivity with three vibration ranges: 0 to 0.1 mils, 0 to 1.0 mills, and 0 to 10 mils.

The Model V/p-T, designed for pipeline use, operates on 48 or 60-volt d.c. with the a.c. line used only to actuate a calibration circuit. Source: **Indikon Co., 76 Coolidge Hill Rd., Watertown 72, Mass., U.S.A.**

Want more facts about equipment or copies of product literature described in this issue?

Send this **Showcase Coupon**

to manufacturer at address shown in bold type after each item.

Product name, Model no., literature title or number: .....

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Described in OIL AND GAS JOURNAL - Issue of February 13, 1961

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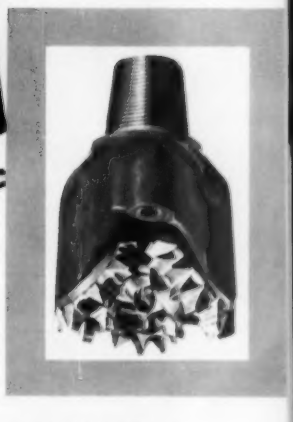
BETTER HYDRAULICS are built into REED FLUSH-FLO JET BITS



up to 50% more return area

REED and ONLY REED offers you jet bits with FLUSH-FLO action and these six exclusive features.

1. Additional return circulation area for faster removal of cuttings.
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These six Reed exclusive advantages mean *dollars saved* for you. Let the Reed man who calls on you give you the full story. He can show you how Reed Y Bits actually give you more footage per dollar spent.

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what makes an acid treatment profitable?

In Oklahoma, a Dowell-engineered acid treatment gave the desired production increase, yet cost $1350 less than treatments used on other wells in the same field.

In Utah, Dowell-engineered acidizing boosted well production from 34 to 450 bopd in a field where other acid treatments had broken through to water.

In South Texas, a Dowell-engineered acid treatment opened up a salt water disposal well where earlier treatments had failed.

What single difference made these treatments more successful than earlier efforts?

The one difference that towered above all others is engineering. Dowell designed each treatment to fit well conditions and the operator's needs. The result was extra profit.

Dowell is well-qualified in the kind of engineered treatment design that results in excellent profit increases.

Dowell developed the Acid Guide* — a new method for designing treatments and predicting probable results. Several thousand successful acid jobs have been designed with the help of the Acid Guide within the past two years.

Dowell has an unsurpassed fund of data on formation and fluid characteristics from many fields. This information is necessary for scientific treatment planning but it is often not available from individual operators.

Dowell has a large variety of acid additives as well as collateral products and services to improve results from acid treatments.

To summarize, Dowell has the experience, the information, the acid additives, the collateral products and services, the technically-trained personnel and the laboratory facilities to design engineered acid treatments. Results have been high success ratios and satisfactory payouts on investments.

There *is* a difference in acidizing services. Dowell services and products are offered from more than 150 offices and stations in the United States, Canada, Venezuela, Argentina, Germany, France and the Sahara area. Dowell, Tulsa 1, Oklahoma.

*DOWELL SERVICE MARK

SERVICES FOR THE OIL INDUSTRY

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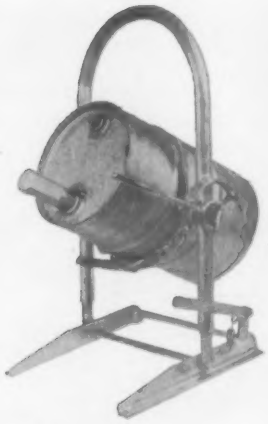

Barrel stand

. . . eases handling of 50 or 55-gal. steel barrels. Easily operated by one man, the Western Safety barrel stand is built of welded steel and designed for use on the ground, on platforms, or on trucks.

It picks up barrels, tilts them, and holds them in a dispensing position. The barrel can be rotated to mix the contents each time liquid is dispensed. Enough clearance is provided to allow the dispensing valve to be left on the barrel and to permit the barrel to be drained from an upside down position. Too, the barrel can be left locked in a tilted position or turned upright to prevent loss through a leaky valve.

Both double and single-barrel models are available. On the double-barrel model, the barrels are completely separate from each other. Source: **Henry H. Paris Distributor, Inc., 1125 Rothwell, Houston, Tex., U.S.A.**

●

Rubber lining

. . . bonds readily to metal and other surfaces with field-applied cement. The natural-rubber covering, trade-named Jade Green Armabond, will protect equipment against abrasion and most inorganic salts, alkalis, and acids, the maker says.

The linking may be cold-bonded to several different surfaces such as metal, fabrics, and other rubber compounds. To apply the lining in the field, clean the surface to be covered and spread on cement, then place the lining over the surface. The lining comes in thicknesses from 1/16 to ½ in. in 48-in. widths. Source: **Goodyear Tire & Rubber Co., 1144 E. Market St., Akron, Ohio, U.S.A.**

Short, compact, less to drill up

Type BC

OTIS

Wire Line Bridge Plug

Small O.D. offers ease of running.

Can be set with any pressure setting tool.

The Type BC Otis Wire Line Bridge Plug is designed to take the guesswork out of plugging, yet it costs you no more than an ordinary plug. It's short and compact — less to drill up — and has an unusually small O.D. for ease of running. The Type BC has been successfully run on many occasions where other plugs failed to get down. And a feature you will particularly like is that the Type BC Otis Bridge Plug covers a wider range of casing weights than any other plug available today. This feature alone has saved many times the cost of a plug where accurate casing weight records were not available.

AVAILABLE FROM ALL ELECTRIC LINE SERVICE COMPANIES — STOCKED AT 247 FIELD LOCATIONS. Not only are Otis Wire Line Bridge Plugs available through any electric line service company, but stocks are maintained at 247 different field storage locations so that you can set an Otis plug whenever you need it — wherever you need it. And Otis bridge plugs can be set on any type of pressure setting tool. So the next time you need a bridge plug to prevent movement of fluid or gas from either direction in the casing, or to plug and abandon — play it safe — specify an Otis Wire Line Bridge Plug.

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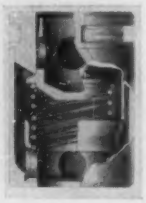
OTIS ENGINEERING CORPORATION

General Offices: 6812 Denton Drive, Dallas

Branches Throughout the Oil Country

Cartridge type of check valve



. . . recently announced is claimed to permit simplified installation as an integral part of any pneumatic or hydraulic system. The Model C-200 valve is designed to be placed in a single bored hole, offering a way to avoid bulky piping arrangements.

Available materials are steel and aluminum. Sizes range from ⅛ to ¾ in. Operating pressure ranges up to 5,000 psi. Source: **Circle Seal Products Co., Inc., 2181 E. Foothill Blvd., Pasadena, Calif., U.S.A.**

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Computer

. . . for compressor stations recently designed is a special-purpose type developed to repeatedly calculate the horsepower being delivered at a compressor station. It then adjusts the compressor or cylinder pocket settings and the number of engines running to allow each engine to deliver its maximum horsepower under any variations in operating conditions.

The computer operates with telemetering equipment to permit one station to completely control and monitor another station. Source: **International Controls Corp., 3110 Eastside, Houston, Tex., U.S.A.**

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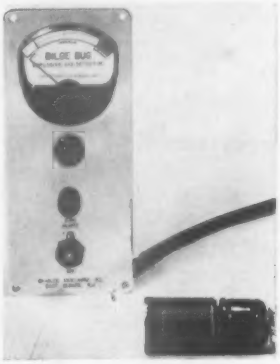
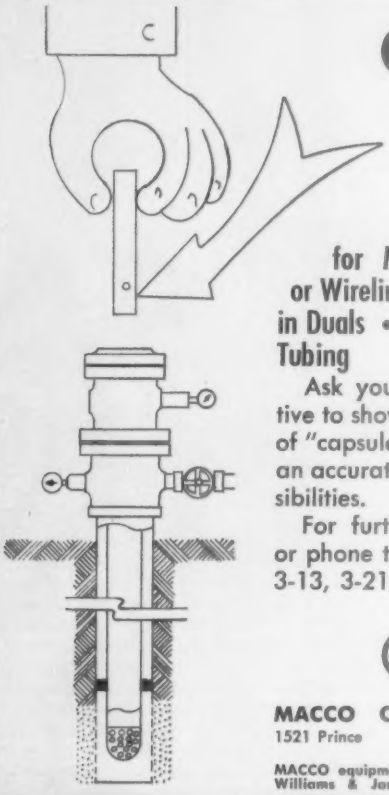


Combustible vapors detected

. . . with a new instrument now being sold, called a Bilge Bug. The instrument is primarily intended for use aboard boats. But the maker says it can also be used in industrial plants to detect concentrations of gasoline, natural gas, and other combustible vapors.

The instrument consists of a control and indicator panel, a sensor, and the connecting cable. It comes in models to operate on 6 and 12 volts d.c. Current requirement: 1.2 amp.

The sensor is installed anywhere combustible vapors may collect. The control unit can be placed at a convenient point. Source: **Engelhard Industries, Inc., 75 Austin, Newark 2, N. J., U.S.A.**



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IN A
"CAPSULE"

USE MACCO CAPSULES
for Macaroni or Parallel Strings
or Wireline Retrievable Packoff Anchors
in Duals • Slim Holes • Inside Regular Tubing

Ask your nearest Macco representative to show you where to install a string of "capsule" gas lift valves and give you an accurate estimate of oil recovery possibilities.

For further information, write, wire, or phone today for Brochure Nos. 3-12, 3-13, 3-21, 3-31, and 6-12.

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TIME TESTED
PRODUCTION EQUIPMENT

MACCO OIL TOOL COMPANY, INC.
1521 Prince P. O. Box 7288 Houston 8, Texas
Phone UN 1-1253
MACCO equipment is also available in sterling areas from Williams & James (Oil Tools) Ltd., Gloucester, England.

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Keep Slim-Hole and Workover Rigs Busy!

■ Designed for small rotaries and deep well-servicing units. Lifting ring travels only 3½ inches. Slip bowl bore is 6½ inches. Will also accommodate 4½-in. and 5-in. casing.

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Power Slips
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TULSA, OKLAHOMA

HALLIBURTON MUD REMOVAL SOLUTIONS

point to...

better completions!

More effective squeezing!

Faster payout!

Specific well conditions, type of formation and the type of contaminating mud are the three most important factors for you to consider in choosing the type of mud removal solution that should do the best job.

Many times in the past, a casual diagnosis dictating the use of a chemical "wash" for the removal of drilling mud has lead to failure. Using the same treating solution for all cleaning problems can often be a mistake.

HALLIBURTON CHEMICALS HELP SOLVE SPECIFIC MUD REMOVAL PROBLEMS... HERE'S HOW:

MCA – Mud Cleanout Agent is a mixture of Morflo II (a surfactant blend) and hydrochloric acid. The high concentration of Morflo II in MCA makes it equally effective in both sand and calcareous formations as a first-stage completion treatment as an aid in removing mud, water blocks and breaking emulsions.

HF ACID is a mixture of hydrochloric and hydrofluoric acids, mixed in different proportions to suit well conditions and problems. HF Acid contains surfactants to alter surface properties. It is used primarily in sand formations for mud removal. It is also used to clean sand zones being utilized for brine disposal.

MUD FLUSH is a non-acid, water-base solution that aids in removing drilling mud by lowering mud viscosities and dispersing the clay solids. Mud-Flush has low surface tension and non-emulsifying properties in addition to mud thinning and suspending characteristics.

OILSPERSE is a hydrocarbon-base treating mixture containing surfactants. It is designed for use in wells contaminated with oil-base or oil external emulsion mud. Oilsperse also has been used successfully in freeing drill pipe stuck by differential pressure.

These are a few examples of how Halliburton couples research with ingenuity to bring you the best in Chemical Services. Contact your Halliburton representative for full details.

Continue to look to Halliburton for Leadership!

CHEMICAL SERVICES

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COMPANY • DUNCAN, OKLAHOMA

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dark work areas
and confined spaces

DAY-RAY

PORTABLE FLUORESCENT

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Safe: vapor and moisture tight. Always cool. Can't burn mechanic's hands. Approved by safety engineers.

Easy to use: light weight. Small diameter. Easy to grip or hang.

Economical: long life. Withstands vibration. Easily relamped.

In 6, 8, 13, 15 and 30 watt sizes. 18" handles available.

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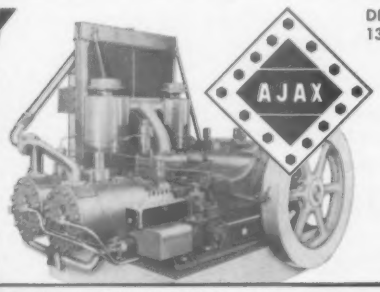

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CASING
HEADS

SHOWCASE . . .

New Equipment

Sight-glass

. . . offers added safety where chemical reactions of liquids and vapors under high pressure and temperature must be studied by plant personnel, the maker says. Safety range of the unit is said to be from high vacuum to 30,000 psi.

The Pressure sight glass and its Safelite lens are expected to prove useful in a variety of refinery and petrochemical plant applications. According to the maker, the device can be shielded by selecting the proper glass shielding disk. The principal parts are a flanged body, the lens, compression ring and adjusting screws, lens packing, and cushion gasket. Source: **Pressure Products Co., P. O. Box 424, Charleston 22, W. Va., U.S.A.**

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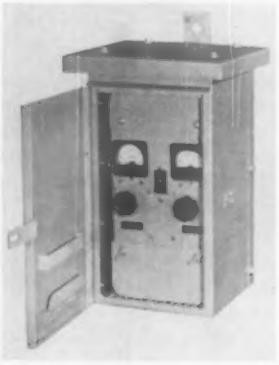

Cathodic-protection rectifier

. . . now on the market comes in two versions: selenium and silicon. The maker lists numerous features for the rectifier: small size, lightweight, electrical components derated for long useful life, high conversion efficiency, voltage selection in small increments, and convection cooled.

The selenium rectifier is designed for a minimum expected useful life of 15 years, the maker says. A magnetic circuit breaker in the transformer secondary protects the rectifier from overcurrent when external loop resistance drops.

The silicon rectifier features hermetically sealed construction of the silicon diodes in full-wave or center-tap assembles that protects them against external deteriorating elements. Source: **Lester Equipment Mfg. Co., Inc., 151 W. 17th, Los Angeles 15, Calif.**

●

Sludge pump

. . . moves 40 g.p.m. at a 200-ft. head, the maker claims. The Model CP-71 pump is designed to handle liquid containing up to 15% solids. Operating on the ejector principle, the pump is claimed to handle rock-

S. E. HUEY & CO.

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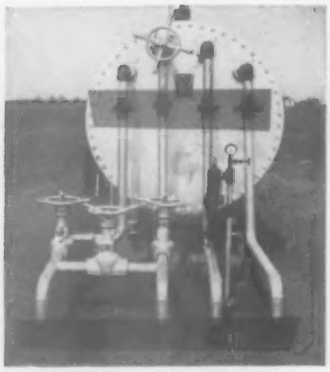
Oversize Pumps: 1½" Bore for 2" Tubing, 2⅛" for 2½" Tubing, 2½" for 3" Tubing.

Thompson PUMP COMPANY

DRAWER 591 OKMULGEE, OKLAHOMA

WECO UNIONS



Heater Hook-up with WECO Unions

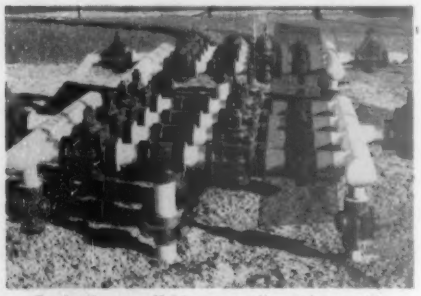
Blowout preventer control lines with WECO Unions and Chiksan Joints

ARE EVERYWHERE IN THE OIL INDUSTRY

On the drilling rig you find them on mud suction and discharge lines . . . on fuel, steam and water lines . . . on stand pipe connections . . . blowout preventer hook-ups. You will find them, too, on service company trucks, lines and head connections in cementing, acidizing and fracturing operations.

Wherever there is production, WECO Unions are used in making up headers and manifolds; tank, heater, treater and separator installations; on flow lines, meter connections and wherever else unions are used for faster, more efficient piping. You will find them also on offshore rigs, platforms and production hook-ups—on water flooding and repressuring projects.

There is a WECO UNION of the right type, size and pressure rating for every service in every phase of the industry . . . and they are available from stock at Supply Stores everywhere.



Production manifolds are easily made-up with WECO Unions

U-3-61

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WECO UNIONS · CHIKSAN SWIVEL JOINTS · HAMER LINE BLIND VALVES · HAMER PLUG VALVES · WECO AIR-O-UNION · WECO COMPOUNDS · WECO SNATCH BLOCKS

New Equipment

drill cuttings, sand, or other solids without causing wear of the internal parts.

Air passing through a venturi pulls liquid into the pump. When the pump becomes full, air pressure forces the liquid out. The cycle is then repeated. Designed to be used with or without suction hose, the pump operates from an 85-cu. ft. per minute compressor and requires no priming. Source: **Chicago Pneumatic Tool Co., 6 E. 44th., New York 17, N. Y., U.S.A.**

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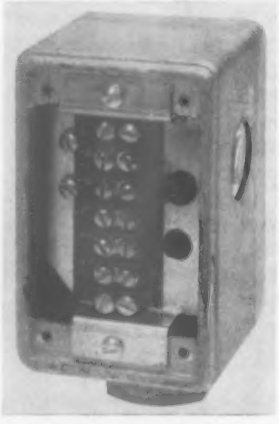


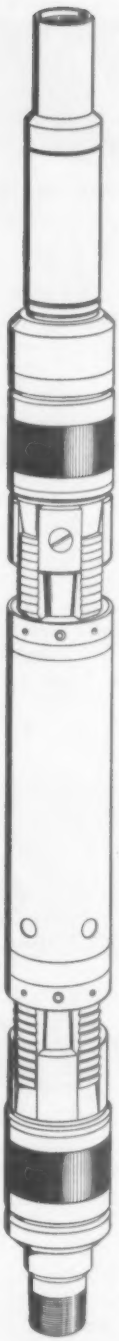
Photoelectric projector, receiver

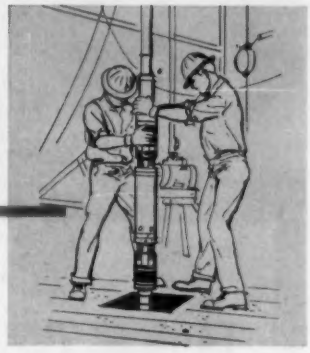
. . . offer a number of uses in the petroleum industry for counting, signaling, alarming, and control. The Type LR1 photoelectric relay is designed for rugged use. It is said to be waterproof, dustproof, and vibrationproof. The cast-iron housing has a galvanized finish and a screw-held cover.

Working in any position, it operates directly connected to a 105-130-volt, 60-cycle power supply. When at least 10 ft.-candles of light enters the lens, the photocell operates the relay. When most of this light is removed, the relay releases. For counting operations, speeds up to 600 per minute are possible.

The light projector (not shown) supplies a light beam for operating the photoelectric relay at distances up to 25 ft. It too is waterproof, dustproof, and vibrationproof, the maker says. Source: **Electric Eye Enterprises, 1935 N. W. 191st., Opa-Loca, Fla., U.S.A.**

BROWN HS-16-1 PACKERS FOR DOWN-HOLE PROFITS





HS stands for "Hydraulically Set" in the type designation of this advanced design, multi-purpose packer because it is simply set by hydraulic pressure.

HS also stands for "Highly Salvable" because this packer is readily retrievable and may be rerun immediately after servicing.

HS also stands for "Hydrogen Sulfide" because this packer – without springs on wiper blocks to become embrittled, with lead seals to protect the synthetic rubber seals, and with H_2S resistant materials throughout – is ideal for areas where H_2S is encountered. But, however you name it, no other packer has the versatility or offers the profit making advantages of the Brown HS-16-1. Just check these money saving features:

MULTI-PURPOSE • A packer for single zone completions • A packer for single-string dual completions • As the lower packer in multiple-string completions • As the packers (any number in the same well) for multiple alternate-zone installations. • An excellent packer where acidizing or fracturing is being done. Dual slips enable the packer to withstand high differential pressures – pressure exceeding tubing limit.

RUNNING • **Circulation with the well head in place,** and before setting the packer eliminates wire line work. • Savings in rig time while running and setting. Ample by-pass area allows free flow of well fluid around the packer. • The HS-16-1 is easily run in straight or deviated holes. • No difficulty in running the packer into the top of a liner.

SETTING • **Positive well control is achieved since the well head is installed before the packer is set** or drilling fluid displaced. • **Producing zones may be washed after the well head is installed.** • No tubing manipulation necessary to set packer. • Design eliminates the possibility of premature setting. • The "hydraulically-set" feature minimizes the problem of spacing out. • Set at any depth as no tubing weight is required when setting. Hydraulic setting allows the tubing to remain in tension due to its own weight. • Treating fluid may be spotted across the producing zone before the packer is set.

PULLING • A fully retrievable packer, the HS-16-1 can be rerun after servicing. The cost of drilling and replacing a permanent-set packer is eliminated. • Swabbing action while pulling is minimized by the built-in equalizing valve and the ample by-pass area around the packer.

All of this adds up to down-hole profits from savings of time and materials, and the plus profit of added safety. The Brown HS-16-1 packers are available in all popular sizes or to your specifications on special order. Just call one of our representatives – they serve production areas throughout the free world.

BROWN
OIL TOOLS, INC.

8490 KATY ROAD P. O. BOX 19236,
HOUSTON 24, TEXAS

HARTZELL Reports . . . on dependable Water Cooling for Houston power station

Operating: 6 years

Performance: Trouble-free

Service: Low cost maintenance

These facts sum up the reliability and economy of Hartzell 14-foot Adjustable Pitch fan assemblies now operating at Houston Lighting and Power Company's Hiram O. Clarke station.

Of a total of 60 fans operating on this large induced draft tower that cools circulating water for power generation, a majority are Hartzell type "P," molded plastic model, which have provided trouble-free, low cost maintenance operation since 1954.

One important reason for the high quality of performance of Hartzell fans on this and thousands of other installations is the use of exclusive Hartzite plastic. This material far exceeds other blade materials in its ability to resist corrosion, abrasion and vibration.

Write for all the facts . . . or, better yet, let a Hartzell representative show you how a Hartzell fan will make "dollars and sense" in your cooling tower and heat exchanger operations.

HARTZELL PROPELLER FAN CO.

Engineering Offices in Principal Cities

Div. of Castle Hills Corp.

Piqua, Ohio

SHOWCASE . . .

New Equipment

Pipe dope in tape form

. . . now available can prove useful in a variety of applications for making up threaded joints in all types of pipe. The maker recommends the Pipe-Pac tape for joining metal, plastic, ceramic, rubber, and other pipe materials that carry air, oil, water, gas, steam, chemicals, and corrosive materials. It takes temperatures from —300° to 500° F., the maker says.

The tape will not cake or harden and will prevent freezing of the joint, allowing easy disassembly when needed for maintenance, the maker claims. The material comes in pocket-size rolls 240 and 480 in. long. Source: **Johns-Manville, 22 E. 40th., New York 16, N. Y., U.S.A.**

•

Easier maintenance

. . . and construction can be possible with this new Sky Witch portable hydraulic work-load lift. The Model 10-1117 lift can be used in variety of overhead maintenance and construction work as it is capable of raising a 1,000-lb. load 17 ft. A gasoline engine powers the lift.

Other sizes and models are available with varying height and weight capacities. The lift can be mounted on casters or skids. Source: **Charles Machine Works, Inc., 1959 W. Fir Ave., Perry, Okla., U.S.A.**

"Matched Tools for Unmatched Performance"

WEB WILSON

"CHAMPION" ELEVATOR...

THE UNMISTAKABLE LOOK OF PROGRESS

On rigs where concern is for increased crew efficiency and safety, at reduced costs, you'll find Web Wilson "Champion" elevators at work. Three unique reasons make these elevators the wise choice:

1. *Forward Swept Link Arms* permit easier handling in picking up and laying down pipe.
2. *The Slanted Hinge Pin* makes closing easier and under loaded conditions transfers a portion of the force from the latch to the hinge.
3. *Superior Balance* allows elevators to roll easily in the links. Better balance reduces the need for a balancing strap.

Add to these advantages the massive safety latch designed into the body so that the elevator will not be accidentally opened or damaged. Automatic latching results by the simultaneous action of latch and latch lock which close together.

Write for brochure "A New Dimension in Elevators."

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DIVISION OF JOY MANUFACTURING CO.

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OUR 42d YEAR OF PROGRESS

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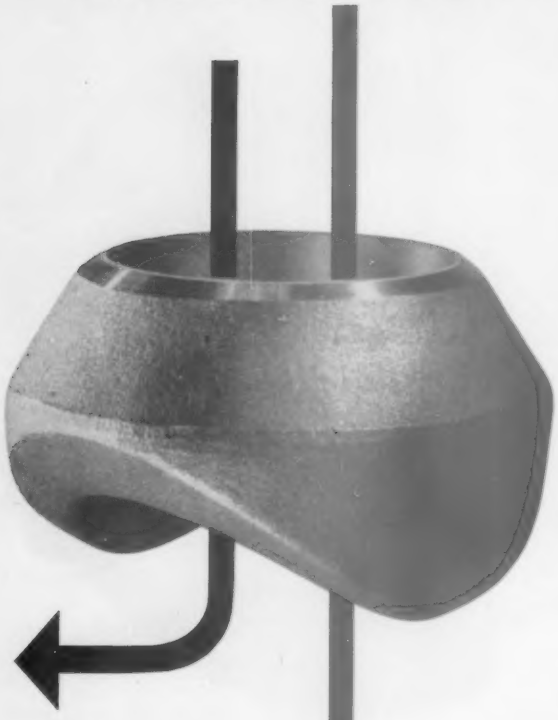

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ON ALL 90° BRANCH PIPE CONNECTIONS

Competitive economic times like these make cost cutting mandatory. Reduce piping costs by using Weldolets instead of welding tees for all full size and reducing branch connections. Contractors and owners are saving thousands of dollars on piping jobs by switching to Weldolets. Are you? Write for information.

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SHOWCASE . . .

New Literature

Screw-type-pump

. . . bulletin features the IMO rotary pump, with pressures to 3,000 psi. and flows to 4,000 g.p.m. Bulletin 3200 (42 pages) includes a selection guide, specifications, tables of performance data, tables of dimensions, viscosity tables, and other general information. The literature also gives the pump's design advantages. Source: **De Laval Steam Turbine Co., 852 Nottingham Way, Trenton 2, N. J., U.S.A.**

Ductile iron valves

. . . and fittings Catalog 1 gives complete details on designs, weights, and dimensions, and includes comparison charts, engineering specifications, and information on prices, terms, and deliveries. One section of the 12-page catalog deals with comparisons between ductile iron and other materials. Source: **Stockham Valves & Fittings Co., 4000 Tenth Ave., Birmingham 2, Ala., U.S.A.**

New electrionic handbook

. . . newly released, covers the application of electric and electronic controls in heating, ventilating, and air-conditioning installations. Illustrated with photographs and diagrams, the 24-page publication explains the theory of electric and electronic control and makes comparisons between electronic and pneumatic controls. Source: **Barber-Colman Co., 1300 Rock St., Rockford, Ill., U.S.A.**

Gas-condensate production unit

. . . the Econo-Pak, is the topic of a new four-page literature piece now being offered free to interested parties. Text details the unit's performance, flow patterns, and safety features. Included are specifications and a gas-capacity chart. Source: **Sauder Tank Co., Inc., 220 Weaver St., Emporia, Kans., U.S.A.**

Properties of monolithic refractories

. . . refractory brick and shapes, mortars and granular materials, and

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MORE DRILLING INFORMATION

THE MODELS G7PW OR G7TW RECORDER

These models of the Geograph Recorder were developed particularly for the contractors and operators desiring more detailed, recorded data concerning the four drilling variables—Rate of Penetration, Drilling Weight, Pump Pressure and Torque. This information is required to compete in today's highly competitive drilling situation.

Geologists obtain more information about rate of penetration and sub-surface formations and toolpushers are supplied with the information necessary to determine the optimum drilling rate for a particular formation.

Engineers and contractors can readily interpret the recordings of weight on bit, pump pressure (or torque), downtime, rate of penetration, tightspots and bit wear in making accurate decisions regarding existing drilling conditions.

The result: more hole per dollar.

When you drill your next well, specify the Model G7PW or G7TW Recorder. For additional information, ask for Catalog No. 220, or call your nearby Geograph Oil Field Services office.

GEOLOGRAPH
OIL FIELD SERVICES
P. O. Box 1276
Oklahoma City 1, Okla.

insulating refractories used in refining and petrochemical plants, are discussed in an obtainable four-page data sheet. It includes tabular data on castable refractories, illustrations of a typical refractory anchor arrangement for catalytic cracking units, and information on acidproof brick, shapes, and floor tile. Source: **Harbison-Walker Refractories Co., 307 Fifth Ave., Pittsburgh 22, Pa., U.S.A.**

Safety control for engines

. . . whether they be diesel, gas, or gasoline, is a mechanical unit used to guard against operation under excessively high water temperature or low pressure, as described in a new four-page brochure. It pictures and describes the Model 2800A safety control, what it does, how it is installed, and how it operates. The brochure is complete with diagrams showing four variations of installation, dependent upon desired function in connection with shut-down mechanism. Source: **Amot Controls Corp., Box 1707, Richmond, Calif., U.S.A.**

Cast couplings for pipelines

. . . is the subject of a 12-page booklet describing and illustrating couplings for various classes and sizes of cast iron or asbestos-cement pipe. Special emphasis is given to transition and reducing couplings which are used to connect pipe having variations in outside diameter. The literature gives specifications and design details, and illustrates other products for use on cast-iron and asbestos-cement pipe. Source: **Smith-Blair, Inc., 535 Railroad Ave., South San Francisco, Calif., U.S.A.**

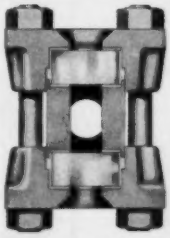
Ductile-iron gate valves

. . . in ½ through 12-in. sizes are featured in new 12-page Form 1011. It describes the Pipe-Pal series, featuring spiral-wound gaskets and a spread-flange design, and the Pipe-Mate series, incorporating a new buttressed-flange construction. In addition to listing engineering specifications, pressure-temperature ratings, and testing data, the publication describes many applications for ductile-iron valves. Source: **Ohio Injector Co., Wadsworth, Ohio, U.S.A.**

Strahman

HIGH PRESSURE GAUGES

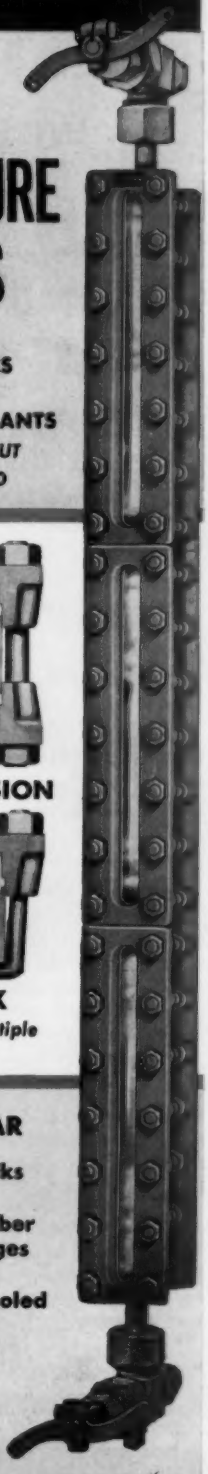
USED IN REFINERIES AND CHEMICAL PLANTS THROUGHOUT THE WORLD



THRU VISION

REFLEX
Single or Multiple Sections

TUBULAR
Gauge Cocks
•
Large Chamber Reflex Gauges
•
Heated or Cooled Gauges



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NICOLET AVE., FLORHAM PARK, N. J.

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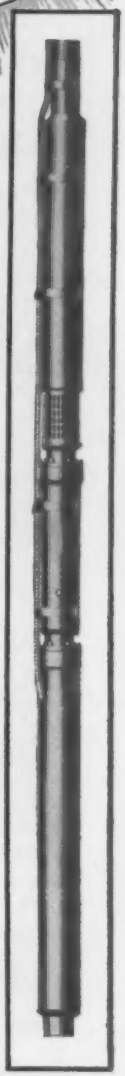
REDA Submergible PUMPS



REDA GIVES YOU THESE COST SAVING FEATURES AND DOES THE JOB BETTER!

- Lower cost for installation, operation and maintenance.
- 250 to 18,000 BPD capacities
- Depths to 10,000 ft.
- Corrosion-resistant construction
- Long life — dependable service
- A complete line to meet pumping requirements

and

INVESTMENT COST IS FAR LOWER WHEN YOU CHOOSE REDA FOR YOUR PUMPING NEEDS.

Write or call for more information. Reda engineers will be pleased to assist and help plan your operations.

SIGN OF QUALITY SUBMERGIBLE REDA PUMPS

REDA PUMP CO.
BARTLESVILLE, OKLAHOMA

Manufacturers of submergible motors and pumps for over 35 years — for oil, brine and water wells, gasoline and jet fuel —

Equipment Men Notes

Carl J. Hockenauer joins ... Auto Crane Co., of Tulsa, as southwestern sales manager, according to Carl White, Jr., president. Hockenauer was formerly manager of Texoma Supply Co., also of Tulsa. Auto Crane manufactures cranes from 600 to 3,000-lb capacities.

C. J. Hockenauer

Continental-Emsco Co. appoints ... Robert M. Erskine to the newly created position of assistant general manager of sales — nontubular. Former manager of subsurface-equipment sales, he began his employment with C-E in 1953 as a sales engineer.

R. M. Erskine

Jim Ritchey

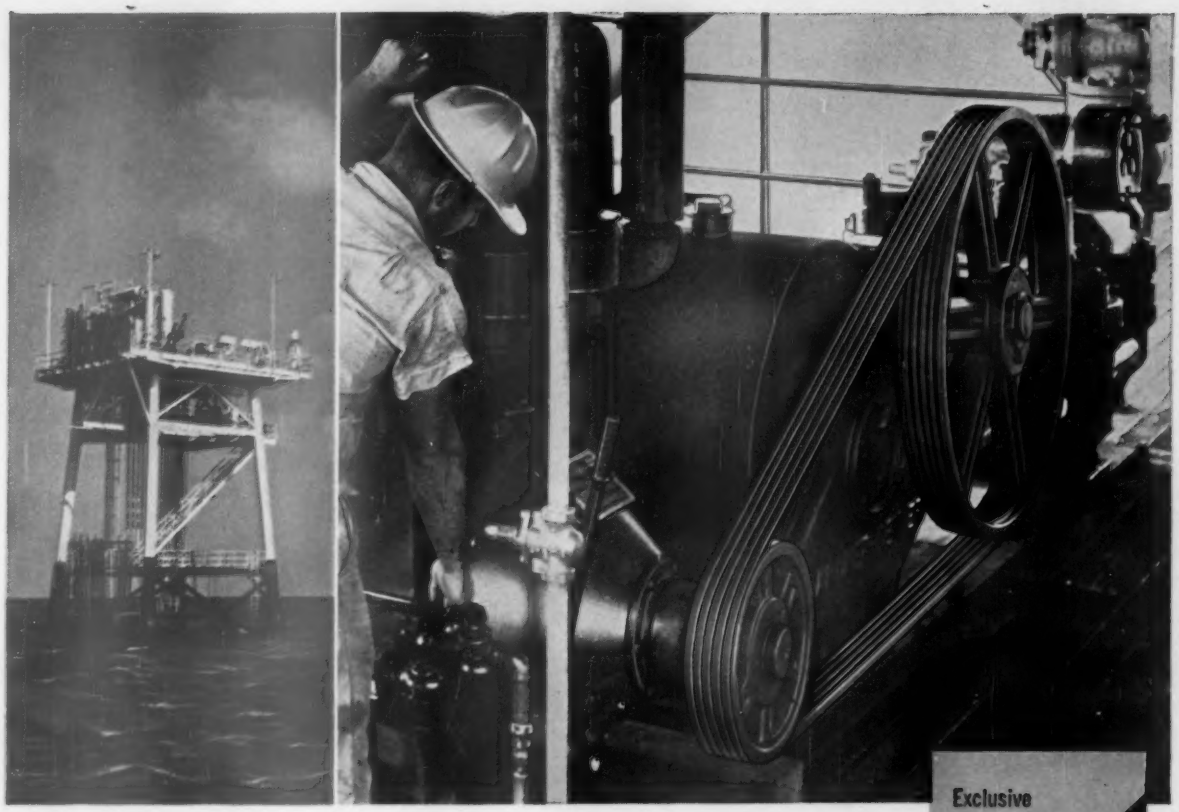
Replacing Erskine as manager of subsurface-equipment sales is Jim Ritchey. Ritchey, former D+B special representative, started with C-E in 1953. He has also served as a district D+B specialist.

Meanwhile, Continental - Emsco announced that it had concluded arrangements with Oil & Gas Supply Co., of Houston, to distribute packaged Joy gas-compressor units in the oil and gas fields of the U. S. The custom-built units, used for gas gathering, repressuring, gasoline plants, and gas lifting, are available for single, two, three, and four-stage operation.

Consolidation plans announced ... by Thompson Ramo Woolridge, Inc., whereby nearly 200 persons will move from various offices, mainly in Los Angeles, to the Canoga Park headquarters in San Fernando Valley. TRW Computers Co., formerly located in Beverly Hills, Calif., will move to the valley location with about 120 people.

Similarly some eastern elements of TRW's headquarters, including several representatives of the TRW wholly owned subsidiary, Magnetic Recording Industries, as well as the closed-circuit Dage Television Division West Coast operations. From Denver some 50 R-W Division information display personnel and members of the Data Systems Lab-

OFFICE AND LAB BUILDING opened in Houston recently by Plastic Applicators, Inc., is part of an expansion program by which the firm has grown from a small plant in 1945 to its present four plants in Texas and Louisiana. Plastic Applicators' major activity is applying corrosion-and paraffin-resistant plastic coatings to oil-field pipe. In addition, the firm has separately operated divisions that provide other services and products. These include Pipe Inspectors Division, which inspects new and used tubular goods; Rubber Applicators Division, which manufactures molded rubber products and applies rubber tank linings; Plastronics Division, which produces electronic products and instrumentation and provides engineering-consulting services; and Cementcap Division, which applies internal cement linings to oil-field pipe.



Gates High Capacity V-Belt Drive handles greater power in less space!

Gates Super HC V-Belt Drives, in use world-wide on all types of machines, are meeting the demand by oilfield equipment design men for a means of transmitting greater power in less space.

Because of exclusive design features, Gates Super HC High Capacity V-Belts handle up to 3 times more horsepower than conventional V-belts in the same space. Or the same power can be handled with fewer belts and smaller sheaves, saving up to 50% in drive space and cutting drive costs as much as 20%.

Further, with smaller, lighter sheaves, bearing loads are reduced. Guards, machine housing, countershafts, etc., can be smaller. Shipping weight is less. The drive can operate at belt speeds up to 6,000 ft/min without dynamic balancing. This permits use of higher rpm motors —with savings in motor costs.

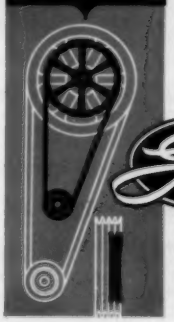
Gates Super HC Drive is the first and most advanced high capacity drive. It is your best assurance that your power transmission units will not soon become obsolete.

There is a Gates Field Engineer serving your area. To contact him, and to get complete information about the Super HC Drive, call your nearby Gates-stocked supply house.

Exclusive design features include:

precisely engineered arched top, concave sidewalls, Flex-Weave cover, super strength tensile construction.

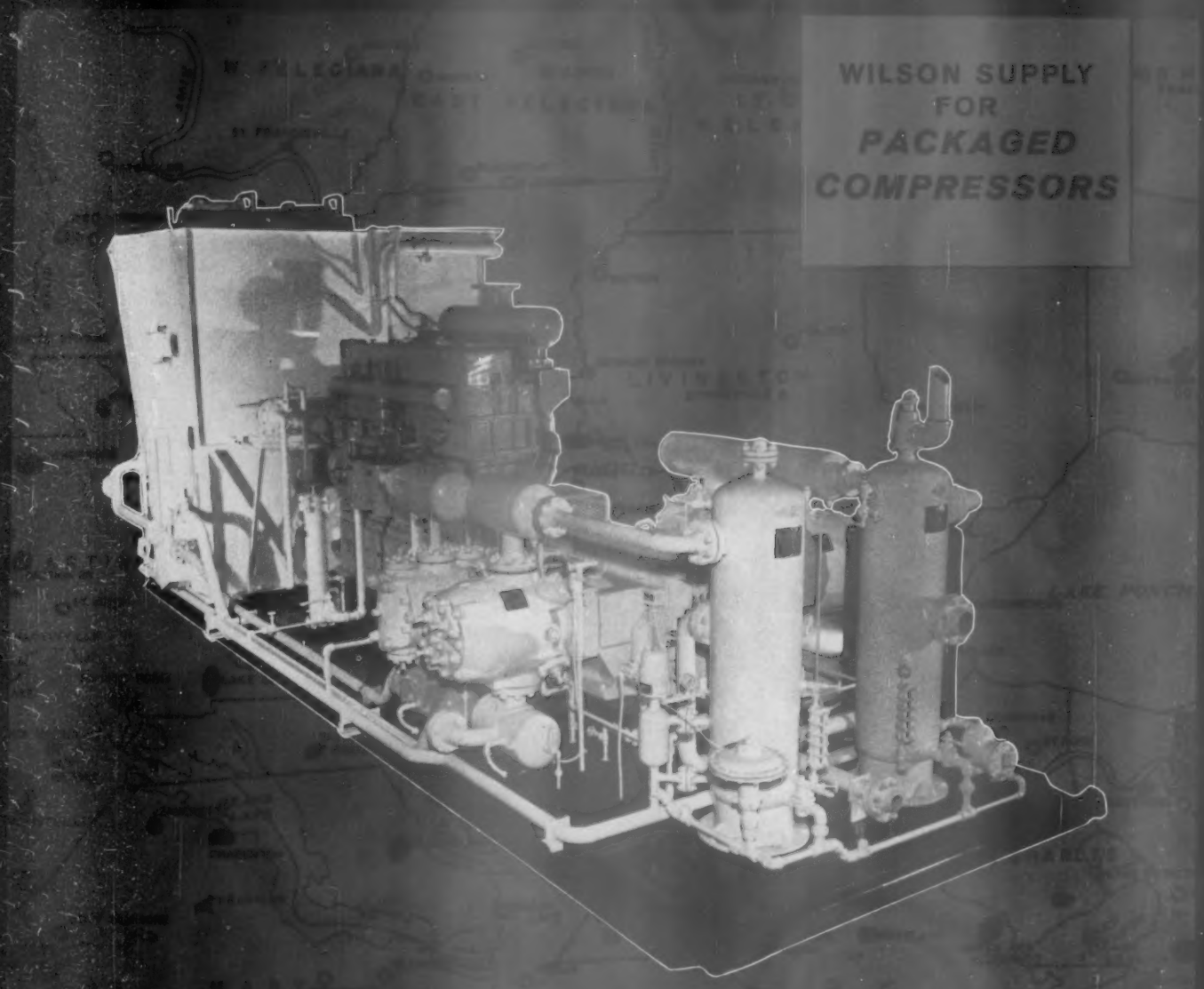
Gates Super HC Drive saves space, weight and money



The Gates Rubber Company, Denver, Colorado BP-8

Building the future on 50 years of progress.

Gates Super HC V-Belt Drives



Three-Stage, 400 HP Compressor with 465 HP Prime Mover

PROFIT PACKAGE

WILSON SUPPLY
HHE
INGERSOLL-RAND

This Wilson Supply-Ingersoll-Rand HHE three-stage 400HP packaged compressor was designed and engineered for double duty. It's in service boosting field gas from several South Louisiana wells for pipeline delivery. Eventually, this versatile HHE packaged unit will handle the field's gas lift requirements as well as sales gas operations.

Thinking of installing a compressor for gas lift or sales gas service? Be sure to get complete details on the profitable performance you can expect from a Wilson Supply-Ingersoll-Rand packaged compressor unit. Write: Compressor Division, Wilson Supply Co., P. O. Drawer 19, Houston 1, Texas, and include suction, discharge pressure and volume to be handled.

WILSON SUPPLY CO
HOUSTON, TEXAS

1301 Conti Street, P. O. Drawer 19, Houston, Texas
International Division
1301 Conti Street, Houston, Texas
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oratory will transfer their functions and personnel to Canoga Park.

Movement of the Electronics Components Group from Beverly Hills to Canoga Park will involve about 12 people, as will movement of the TRW Microwave Division, located at the corporation headquarters in Cleveland.

Paul E. Madeley becomes prexy

P. E. Madeley

. . . of Electrodynamic Instrument Corp., a subsidiary of Reed Roller Bit Co. Formerly executive vice president and engineering consultant of the electronics firm, he succeeds Joseph J. Houghton.

Madeley, a co-founder of EIC, has had experience in research and development work on all phases of seismic exploration equipment and on electronic and electro-mechanical instrumentation for various other industries.

Robert J. Phillips becomes

R. J. Phillips

. . . president of Howe-Baker Engineers, Inc., a subsidiary of Nalco Chemical Co., Chicago. He was formerly vice president in charge of engineering for the Tyler, Tex. firm, which specializes in designing electrical equipment used for desalting and distillate treating in refining.

Other Howe-Baker appointments include: W. L. Altman, technical representative in Nalco's Catalyst Division, named administrative assistant to Phillips; H. G. Napier, promoted from process engineer to chief process engineer; and R. M. Godfrey, design engineer, made chief mechanical engineer.

Leonard E. Bodenhamer named

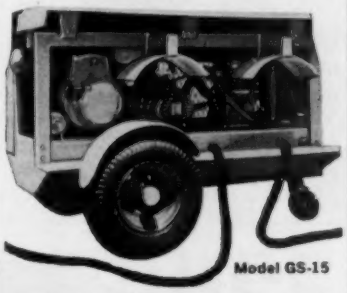
L. E. Bodenhamer

. . . to the Tulsa Mid-Continent district sales office of Cal-Metal Pipe Corp. of Louisiana, announces Kenneth S. Bayless, Cal-Metal's executive vice president. Bodenhamer, who joined the company 3 months ago, is a veteran of 17 years in field sales, service, and purchasing with petroleum and tank-manufacturing companies.

Harry R. Murphy is named

. . . sales representative out of the Chicago district office for Hills-McCanna Co., manufacturers of

NEW PORTABLE
AIR COOLING
UNIT
FOR INDUSTRIAL USES



Model GS-15

Provides fresh refrigerated breathing air to personnel. Eliminates exposure to hazards created by contaminated air conditions that exist in the various phases of manufacturing, cleaning and maintenance processes. Provides body temperature comfort under high ambient conditions. Adaptable to any type of protective suit or coverall. Save man hours and downtime. Send for literature and specifications.

Our 27th year . . . engineering for any specific air conditioning requirement.

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1852 MOORE STREET
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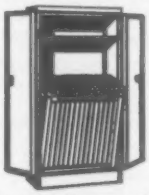
CONFIDENTIAL—DOORS LOCK!

MAP  FILE

The sturdy MT4 steel cabinet map file has 112 tilting tubes. Easy to file and find maps, tracings and blue prints to 60" lengths. Keeps valuable information dust proof and confidential. Popular everywhere in both field and home offices. Write for illustrated information.

SHIPPED IMMEDIATELY FROM STOCK
Patent No. 1610368, Other Patents Pending.
SCOTT-RICE CO., 610 S. Main, Tulsa 19, Okla.

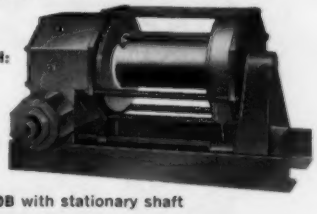
Koenig INTRODUCES A REVOLUTIONARY NEW TYPE OF HEAVY-DUTY POWER WINCH

FEATURING TORQUE TRANSMISSION DIRECT FROM GEAR SPIDER TO DRUM . . . NO KEYS TO SHEAR

20,000 pounds safe hoisting capacity

Outstanding features of the NEW KOENIG WINCH:

★ Drum torque load is NOT transmitted by drum shaft . . . no keys to shear . . . torque is transmitted direct from gear spider to drum by means of multiple-splined collar in gear housing.
★ Entire unit, including safety brake, is lubricated by the oil-bath principle, with a generous supply of oil to prevent overheating.
★ Engineered to use standard lubricants available throughout the world.
★ Multiple-plate automatic safety brake, running in oil with one-direction clutch, is easily adjusted or released.
★ Accurate drum clutch position indicator.
★ Gear ratio — 38:1.
★ Nickel-bronze alloy worm gear. Hardened and ground worm mounted on Timken roller bearings.



Model 70B with stationary shaft

Pat. Pend.

Model 71B with catheads

THIS ADVANCED-DESIGN KOENIG WINCH IS RECOMMENDED FOR OIL-FIELD EQUIPMENT, PUBLIC UTILITIES, HEAVY WRECKERS, CONSTRUCTION, AND OTHER HEAVY-DUTY JOBS.

Koenig winches have served the industry with dependable pull and hoisting power since 1934. Koenig also builds a complete line of utility and service bodies.

IRON WORKS, Inc.
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ball valves, diaphragm valves, chemical proportioning pumps, lubricators, and light alloy castings. Prior to joining Hills-McCanna, Murphy was Chicago area district manager for Stratoflex, Inc., of Fort Worth.

Eugene McCoy is appointed

. . . assistant manager of gas-engine-compressor sales for Cooper-Bessemer Corp., according to D. L. Reed, department manager of the Mount Vernon, Ohio corporation. Previously programing analyst, McCoy joined Cooper-Bessemer in 1954.

J&L Supply Division delivers

. . . the first portable water-flood unit designed and built by the Tulsa firm to an independent oil company's lease near Stroud, Okla. The unit, designed for pilot flood operation, includes an injection pump and driver, circulating and backwash pumps, water filter, and control equipment. Components are mounted on a steel skid with maximum walk-around space for access during operation and for ease of maintenance.

Installation at the lease required only the necessary electrical and water connections with the lease lines and power supply. Capacity of the unit is 2,000 bbl. per day at a maximum discharge pressure of 940 psi.

Clint Cross is elected v.p.—mfg.

. . . for W. C. Norris Division, Dover Corp., Tulsa, succeeding R. A. Colgin who retired after serving 32 years as head of the manufacturing department.

Clint Cross

R. A. Colgin

Cross has been with W. C. Norris in varying capacities since 1933, and has been general superintendent for the past 15 years. James A. Howard succeeds Cross as general superintendent, and A. J. Scott takes over as assistant superintendent, succeeding Howard.

Turner Armstrong assumes title

. . . of vice president of Halliburton Co. in charge of the Welex Division. His election follows Welex's merger into Halliburton from a wholly owned but independently managed subsidiary corporation to an operating division.

Armstrong joined Halliburton in 1940, and since has worked in Mid-Continent and California operations. Most recently he was a vice president of the Welex subsidiary, until its merger with Halliburton. Armstrong will be based in Houston.

Thomas C. Sutton takes post

. . . as general manager of OPW Corp., assuming the former responsibilities of Gilbert B. Richards, president, who died. Sutton has been OPW's vice president of sales since 1957. Richards joined the corporation as executive vice president and director in 1949. He became president 2 years later.

Target → Longer Service

TYPE 30 — Carbon-Manganese fully normalized. For heavy duty where corrosion is not a major problem.

TYPE 75 — Nickel-Chromium-Molybdenum Steel, normalized and tempered. For extremely heavy duty in medium corrosive fluids.

TYPE 40 — Nickel-Molybdenum Alloy. Normalized and tempered. For heavy duty pumping in medium corrosive conditions.

TYPE 78 — Carbon-Chromium-Molybdenum Boron Alloy, normalized and tempered. For heavy duty pumping in non-corrosive or inhibited fluids.

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Oildox Services is established ... in Fort Worth by Cardox Division of Chemetron Corp., to make available carbon dioxide, storage, and injection equipment to oil producers engaged in secondary-recovery operations, under a rental, lease, or contract plan. O. A. Brightwell, Jr. is manager of national sales and engineering, and A. George Wright is manager of field engineering and services.

Ralph M. Parsons Co. reports ... the expansion of services to the petroleum industry to include automated production and transmission systems, with the appointment of Sturgis L. Stenz as manager of the petroleum automation department.

Stentz, whose background includes more than 20 years in design and installation of petroleum-production facilities, was responsible for the development of the "single tank system" of lease production. He formerly was with National Tank Co., Sargent Engineering Corp., and operated his own equipment company specializing in lease-automatic-custody transfer.

John M. Crocker is manager ... of fitting sales, Pyle-National Co., announces E. M. Nesvig, vice president-marketing of the Chicago-based firm. Crocker, former assistant manager of fitting sales following 5 years as field sales engineer, started in the company's design-engineering department in 1949.

Worthington names distributors ... to handle power-transmission equipment, including positive drives, variable-speed drives, multiwedge and multi-V drives, all made by Worthington Corp. Distributors are: Webb Pump Co., Escondido, Calif.; Marine & Ship Supply, Inc., San Francisco; S.A.I.S. Bearing Supply Co., Dos Palos, Calif.; and Marshall Supply & Equipment Co., Tulsa.

Plastic manufacturers combine ... to form Kraloy-Chemtrol Co. Kraloy Plastic Pipe Co. makes plastic pipe, conduit, and fittings; and Chemtrol, plastic valves and pumps. The new organization will remain a subsidiary of Rexall Drug & Chemical Co. Officers include Victor J. Haydel, president; Russell W. Johnson, vice president and general sales manager; and Donald Jenson, manager of engineering and production.

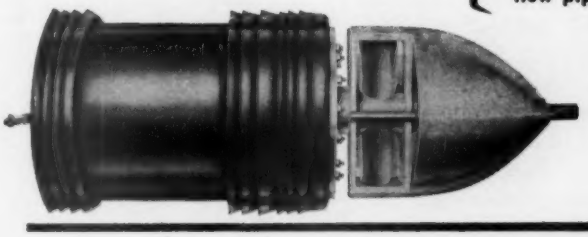
Otis Engineering Corp. makes ... three new assignments and appointments in its gas-lift sales force. J. L. Morrison has been appointed gas-lift sales engineer for the Laurel, Miss. area. He formerly was located in New Iberia, La.

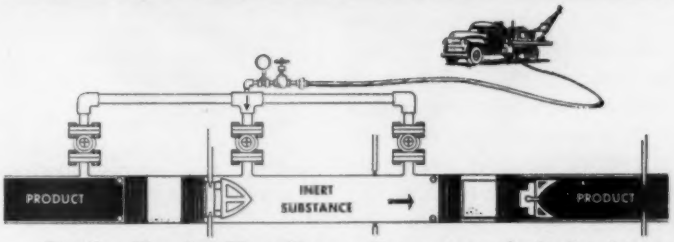
Marvin Porter takes over as gas-lift sales engineer for the Victoria, Tex. area. Previously Porter was a petroleum engineer for a Texas oil producer. Lee Bidwell has become Otis' gas-lift sales engineer for the Belle Chasse-New Orleans, La. area.

John I. Rudge appointed prexy ... of Carlon Products Corp., Aurora, Ohio, maker of plastic pipe and fittings. Formerly executive vice president, Rudge has been associated with Carlon since 1948. It was also announced that William W. Clark, from Continental Oil Co., has been appointed secretary of the corporation.

3-P PIGS REDUCE DOWN TIME CUT COSTS ON

- plugging and evacuating pipelines for replacement or repair
- hydrostatic testing of existing pipelines
- hydrostatic testing of new pipelines





Pipeline Plugging Pigs offer you these economical advantages: Minimum of down time. Virtually no loss of line contents. No need to drain the line. No heavy equipment needed on the job site. **No large fittings left on the line.** The line is purged with an inert substance BEFORE the cut is made. A positive seal is assured during the duration of the job. Write today for our illustrated brochure containing complete details.

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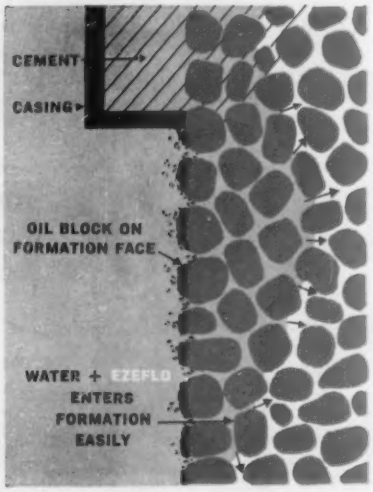
TELEPHONE WEbster 9-6894

new agent to lower water injection pressures



A new agent has been developed by Dowell to lower water injection pressures required to pump fluids into disposal or secondary recovery injection wells. The new chemical agent, called Ezeflo*, is a low-pour-point, water-soluble, nonionic surfactant. Ezeflo lowers the surface tension of water and the interfacial tension between water and oil. It also acts as a detergent for removing oil particles blocking water injection; thus reducing the pressure required for a given rate of flow. A major advantage of Ezeflo is its ease of handling. Ezeflo dissolves in water much more readily than many similar products. This assures good distribution and increases the efficiency of the solution. The low pour-point of Ezeflo (—33°F) makes the product usable in cold climates. Ezeflo is packaged 50 gallons to the drum and is available from any Dowell station.

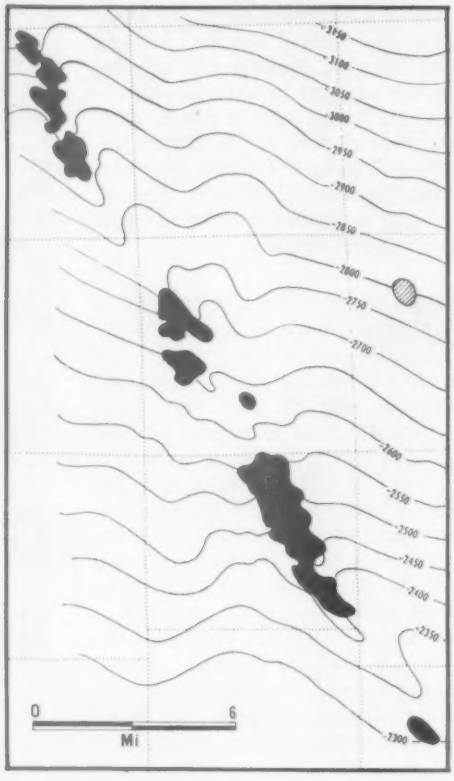
*DOWELL TRADEMARK

PRODUCTS FOR THE OIL INDUSTRY

DOWELL

DIVISION OF THE DOW CHEMICAL COMPANY

Trenton-Black River Oil Pools
Calhoun-Jackson-Hillsdale Counties



Regional contours on top of the Trenton

Data on active fields:

Scipio trend

1. Approved field names: Adams, Albion, Pulaski, and Scipio. Location: Calhoun, Hillsdale, and Jackson counties in southern Michigan; Scipio field (south of 20-4s-3w), Albion field (north of 20-4s-3w).

Discovery dates: Scipio, January 1957 (oil); Albion, December 1958; Pulaski, January 1959; Adams, September 1959.

3. Trend of development: Northwest-southeast, approximately 25 miles long.

4. Number of producing wells: Over 300.

5. Spacing pattern: 20 acres.

6. Proved acreage: Over 13,000 acres.

7. Principal operators: McClure Oil Co., Perry Fulk, Ohio Oil Co., Humble Oil & Refining Co., Mask & Wood, Sun Oil Co.

8. Present allowable: 125 bbl. of oil per day; 165 M.c.f.d. of gas.

Drilling Operations

9. Number of active drilling rigs: 23.

10. Casing program: 16-in. surface set at 300 ft. with 250 sacks cement (only in city of Albion), 10 or 8-in. intermediate set to 1,000 ft. with 450 sacks, 7 or 5½-in. oil string set above pay or through it with 150 sacks.

11. Average drilling time per well: 16 days.

12. Types of drilling fluid: Bentonite, oil, chemical.

13. Completion methods: Open hole, perforate casing, acidizing, and fracture treatment.

14. Types and sizes of bits: 10-14 bits; 2-4 rock bits required to drill 340 ft. of Trenton.

15. Special drilling problems: Trenton formation is hard drilling. Lost circulation in conjunction with gas-pressure buildup.

Geology

16. Producing formations and depths: Trenton dolomite 3,500-4,000 ft., Black River dolomite 3,800-4,300 ft.

17. Reservoir characteristics: Water and gas in solution drive. Gas-oil ratio: 40:1 up to 10,000:1. Oil-water contact, −2,900 to −3,240. Gas-oil contact, −2,730 to −3,100.

18. Geologic markers: Traverse 1,300-1,600 ft.; Niagaran 2,300-2,700 ft.; Trenton 3,500-4,000 ft.

19. Type trap: The Albion-Scipio Trend is located on the southern flank of the Michigan basin and the various formations dip in a northerly direction. Structure maps on the top of the Trenton formation indicate a shallow depression which plunges northwest. On either side of the above-described depression the formation is a dense limestone with very little porosity, while in the depression itself, the formation is a dolomite, probably of secondary origin.

20. Core data: Porosity, 5-10%. Permeability, fractured 1,000 plus md. Residual oil saturation, 9%. Total water saturation, 35-40%. Cored interval, Trenton-Black River. Net feet of pay, 45 average (130 average gross). Specific core analyses: Trenton: porosity 3.6%, permeability 42.8 md., residual oil saturation 9.7%, total water saturation 43.4%. Black River: porosity 4.5%, permeability 17.5 md., residual oil saturation 7.7%, total water saturation 38.8%.

21. Estimated recovery: 100-125 bbl. per acre-ft.

22. Pressures: Average shut-in, 1,500 to 1,700 psi.; average flowing, 1,300 to 1,600 psi.

23. Tests and logging procedures: Gamma ray-neutron logs are run in cased holes. Some rotary wells run electric logs before casing.

24. Pipeline outlets: Ohio Oil Co., Leonard Crude Oil Co., Osceola Pipe Line Co.

25. Exploration methods before discovery: Gravity and random drilling.

26. Average costs: Dry hole, $34,000. Flowing well, $60,000. Pumping well, $68,000. Average total depth, 4,200 ft. Footage rate, $5. Day rate (with pipe), $750. Average lease price, $1 per acre.

27. Crude analysis: Gravity, °API, 39-42 (40.7). Sulfur, 0.181%. Viscosity at 50° F. S.s.U., 53.6. Viscosity at 100° F. S.s.U., 39.9. Pour point, +10. B.s. and w., trace BS—no water. Salt, 17.8 lb. per 1,000 bbl. H_2S, 39 lb. per 1,000 bbl. HC1, 12 lb. per 1,000 bbl. Oil sells for $2.95 per barrel at wellhead.

28. Yield data:

Product	%	Vapor temp. (°F.)	Gravity
Gasoline	15.2	220	78.0
Naphtha	16.8	390	57.2
Kerosine	13.0	510	45.8
Diesel	10.4	600	40.5
*G.O. or L	32.9	1,040	29.6
Residue	11.7	...	...

*Gas oil or lube distillate.

Gas is 62% methane, 22% nitrogen, 9% ethane and propane, and has 850-B.t.u. rating.

▶▶▶ Why Johnston Verticals work so well in Waterfloods

Versatility and flexibility are the two main reasons why Johnston vertical pumps work so well in waterfloods. For example:

For Raw Water Supply

The vertical turbine was originally developed as a water supply pump so it is right at home in furnishing raw water requirements—regardless of the source. Here are some of its advantages: (1) It works well under both remote control and automatic operation because the bowls are submerged

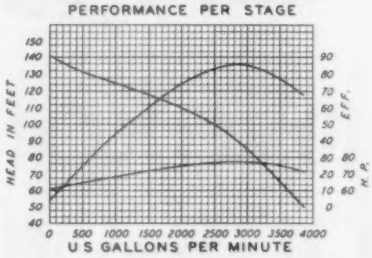


Fig. 1

and hence the pump is always primed; (2) A Johnston operates efficiently at variable heads without overloading the driver (from shut-off to full capacity) because of its steep head capacity curve and flat horsepower requirements (see Fig. 1); (3) It works equally well with any power source; (4) Johnstons are especially resistant to corrosion and abrasion because of vitriform enamel-lined bowls and other construction features.

As a Pipeline Booster

The features that make the pump good for raw water supply also apply to it as a pipeline booster, but it has these further advantages: (1) In-line piping connections permit more straight pipe runs; (2) Impellers can be trimmed or stages added to provide for new pumping conditions without changing the basic construction of the pump; (3) The pump can be pulled without unhooking any piping; (4) Replaceable bearings and wear rings simplify maintenance, while the packing box is readily accessible for easy adjustment.

For Injection Supply

This is where a Johnston really shines, because, above all, Johnstons are *flexible*. (1) Johnstons, for example, will give an almost unlimited range of power-capacity combinations in a system; (2) Pressures can go as high as 2500 psi with capacities

Fig. 2

ranging upward from 3,430 bbls. per day; (3) In most cases, multi-pump stations are used which, with the variations possible within each unit, make for unparalleled efficiency, as well as real operating economy. (See Fig. 2 for typical installation.)

Johnstons have been field proven by experienced operators in many successful waterfloods and we would be glad to give you data to indicate how they could also work well for you. Just call or write for more complete information or ask for an appointment with one of our trained field men.

JOHNSTON PUMP COMPANY

Main Factory: 3272 E. Foothill Boulevard, Pasadena, California; Phone: MU. 1-7601

Factory Branches: 2007 S. E. Main, Roswell, N. M.; Phone: MA 2-5942 • Balmorhea Highway, Pecos, Texas; Phone: HI 5-3022 • 415 East "G" Street, Hastings, Nebraska; Phone: 3-1545 North Yellowstone, Idaho Falls, Idaho; Phone: JA 2-8144

Save on exploration operations with new 1961 FORD 4x4'S

SAVE WITH AMERICA'S LOWEST-PRICED* 4-WHEEL DRIVE PICKUP WITH BIG 8-FOOT BOX

Pipeline contractors and utility companies everywhere are finding that Ford's good-looking 4 x 4's are real money-savers for off-road operations. The F-100 Flareside model is America's lowest-priced pickup with 8-foot box! And both the F-100 and F-250 (½- and ¾-ton models) are designed to keep right on saving with *lower* operating and maintenance expenses.

You can choose the gas-saving 135-hp Six, or the 160-hp V-8 that gives extra power and smoothness with "six-like" economy! And . . . on all 1961 Ford Trucks, each part, except tires and tubes, is now warranted by your dealer against defects in material and workmanship for 12 months or 12,000 miles, whichever occurs first. The warranty does not apply, of course, to normal maintenance service and to the replacement in normal maintenance of parts such as filters, spark plugs and ignition points. Never before have you had such protection . . . such evidence of long-term economy!

*Based on a comparison of latest available manufacturers' suggested retail delivered prices

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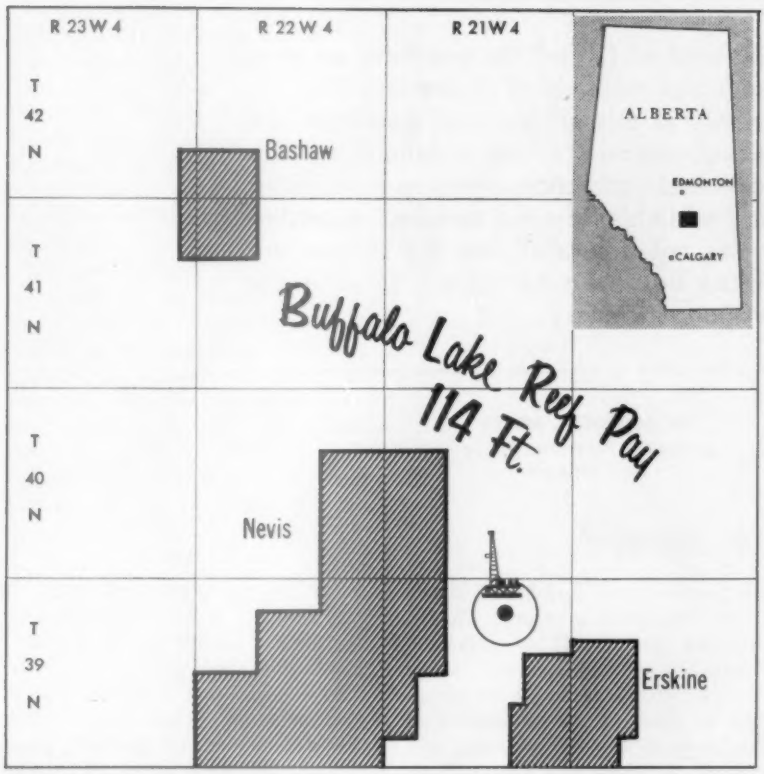


A RICH NEW REEF STRUCTURE has been uncovered by Hunt Oil Co. at its Buffalo Lake wildcat in Section 27-39n-21w4 in South Central Alberta. The discovery cut 114 ft. of Devonian reef, and was finished for 323 bbl. per day of clean water-free oil.

Alberta gets best discovery in several years

BY FRANK J. GARDNER

ALBERTA last week had its most interesting, if not its most important, strike in several years. Squeezed in between two older fields, the discovery well probed the Devonian D-3 section to total depth 5,607 ft. and came up with the thickest reef pay ever found in the southern plains region.

Hunt Oil Co. found a 114-ft. jackpot at its Buffalo Lake 16-27-39-21w4 wildcat, just 1¾ miles northwest of the nearest producer in Erskine field, where the thickest pay section was only 36 ft. Final flowing potential at the new well was 323 bbl. per day on 13/64-in. choke. It was water-free production. On earlier drill-stem tests, the well had flowed as much as 75 bbl. per hour. Other companies who have a stake in the new discovery are British American Oil Co., Ltd., Stanwell Oil & Gas, Ltd., and Inter-Rock Oil Co. of Canada, Ltd.

A surprise hit . . . This is Hunt's first major oil find in Canada and its first one in Alberta; smaller successes had come its way in Saskatchewan. The well was first said to be "running low" for its area, but things perked up when it cut an unusually thin Ireton-Devonian shale section, a standard signal of "reef's below" in Alberta. As it turned out, the reef top was picked at 5,450 ft., 60 ft. lower than the oil-water contact at Erskine to the east. This pegged the Hunt well as the discovery of an entirely new reef.

On first test of the top 10 ft. of the reef section, the Buffalo Lake well flowed 50 bbl. per hour; three later tests of the same interval resulted in 75-bbl. per hour flows. Final completion was made in a 5-ft. interval at 5,516-21 ft. The oil-water contact was set at 5,564 ft.

May cause a second look . . . This Buffalo Lake find is enough to set off a lot of new activity in the south central part of Alberta; lack of success in spotting any new reefs has retarded the search in recent years. Now, the region may see a lot of new seismic search and record reexamination. The Buffalo Lake reef is not the thickest in Alberta, for that record is held at Golden Spike field, where 620 ft. exists. But it's by far the richest pay yet uncovered in the "south country," and development of the field will be closely watched.

Hunt has announced its first followup well at Buffalo Lake 14-26-39-21w4, ½ mile east of the discovery, and only ¼ mile north of a dry hole drilled to 5,743 ft. in 1956 by Home Oil Co., Ltd., and Bailey Selburn Oil & Gas, Ltd. This duster found no reef section after drilling 200 ft. into Ireton shale. Hunt controls more than 6,300 acres in the immedate vicinity of its discovery.

Once again, the elusive stratigraphic trap has demonstrated just how elusive it can be, and how rewarding.

A geologist declares:

"Radiation surveys can find oil"

Are you an egghead oil finder? Do you have an open mind on controversial methods of oil search? Then follow the experience of this professional geologist who has the intellectual courage to take a definite stand in favor of the economical radiation survey as an effective tool for spotting oil fields from the surface. According to this author, it's not a cure-all, not the famous and long-sought "black box," but it can be a valuable cog in your exploration machinery.

BY GEORGE H. MILLER
Geologist, Plymouth Oil Co.
New Orleans

. . . First—what ARE radiation surveys?

MANY PAPERS have been published on the theory behind radiation surveys. Basically, it's a simple theory that can be understood by any layman, consequently, the egghead geophysicist and geologist believe it too simple to work!

Radiation surveys and geochemistry. The phenomena on which radiation surveys depend were first used by geochemists as an exploration tool. It was found by Laubmeyer (1933) that gas leakages were greater over known petroliferous accumulations than nonpetroliferous areas. By 1939 the expensive, precise soil-analysis method had proved the existence of a density pattern surrounding numerous producing oil and gas fields that took the form of a halo. This halo of relatively high gas seepage outlined the producing area.

Davidson (1960) reported that of 20 geochemical anomalies drilled in the Texas Gulf Coast there were 13 productive wildcats and 7 dry wildcats, for a 65% ratio. In North Texas the success ratio was listed as 75%. Twenty-four wildcat wells were drilled in areas of radiation-intensity maps in 1960. Ten of these were drilled on radiation anomalies. Five of them resulted in discoveries, two had good shows of oil, and three were dry. The 14 wildcats drilled off of radiation anomalies were all dry holes. These success percentages are given to emphasize that surface anomalies of gas seepage can be recorded and support the idea that the tortuous path of the gas through both pervious and impervious strata from source to surface is essentially vertical.

Airanium Surveys, Ltd., Saskatchewan, conducted a geochemical survey and a radiation survey over the same area. They reported (personal communication to the author) a startling duplication, in that all the major features of the geochemical survey were faithfully reproduced by the radiation survey, and even many of the minor characteristics were remarkably similar. They further state that an aerial radiometric survey can be carried out in approximately double the detail in one-sixth of the time and at one-third of the cost of the geochemical method.

Chemists found that in the halo where there is an excess of gas movement and escape, there is also an excess of water evaporation. When water evaporates it leaves behind the dissolved minerals. New water coming in takes the place of the escaped water and brings in the normal load of dissolved minerals; among these are uranium salts. The small amount of uranium found in all sedimentary and igneous rocks is the source of the dissolved salts. The gamma rays given off by the decay products of the uranium are what is measured. These soluble uranium minerals and their daughter elements accumulate in measurable quantities in these halos of relatively high evaporation. This continuous slow process has been going on since the entrapment of the petroleum, without regard to the type of trap.

Blocking effect. An oil or gas pool also has low surface radiation, another effect that can be measured at the surface with adequate equipment and personnel. The hydrocarbons have a blocking effect on the passage of the dissolved uranium-bearing salts to the surface. Anyone who has been in a uranium mine has probably observed that the uranium minerals have concentrated around and replaced much of the carboniferous material. It has also been observed that the gamma-ray count of oil is much higher when it is first brought to the storage

tanks than it is a few days later. This blocking effect of hydrocarbons gives a low radiation reading over the petroliferous accumulations and compliments the halo of high readings.

Interpretation. Take any line of numbers in the middle of a radiation low. Go outward, and notice the abrupt jump to a higher number in the halo. Outside of the halo is the norm. The determination of the normal radiation intensity of an area requires several miles of profile. These high and low readings are the anomalies shown on the accompanying maps.

Instrument used. These maps were made by one of the most sensitive gamma-ray detectors known, a 10,000-cu.-in. ionization chamber, coupled to a continuous strip chart recorder. The instrument is relatively huge compared to a scintillator; it is 10 ft. long and 18 in. in diameter. It is preferred not only because of its sensitivity, but because of the very slow, steady rate of drift, something that is very hard to achieve in the most expensive type of scintillator. This constant rate of drift enables an experienced operator to give absolute values throughout the survey based on the starting value.

Experience. The surveys presented here were run by M. E. Douglas. He began making radiation surveys in 1954 while employed by Research, Inc., a contract company that was making radiation surveys for E. DeGolyer. Since 1954, Douglas has been running his surveys on contract basis for various independents. The fact that they have been so accurate in delineating the producing area is the result of Douglas' ability to take into account such field factors as swampy ground, asphalt roads, and soil changes. Radiation surveys run by this one man have outlined producing areas in South Texas, North and Central Texas, North Louisiana, South Louisiana, and Mississippi.

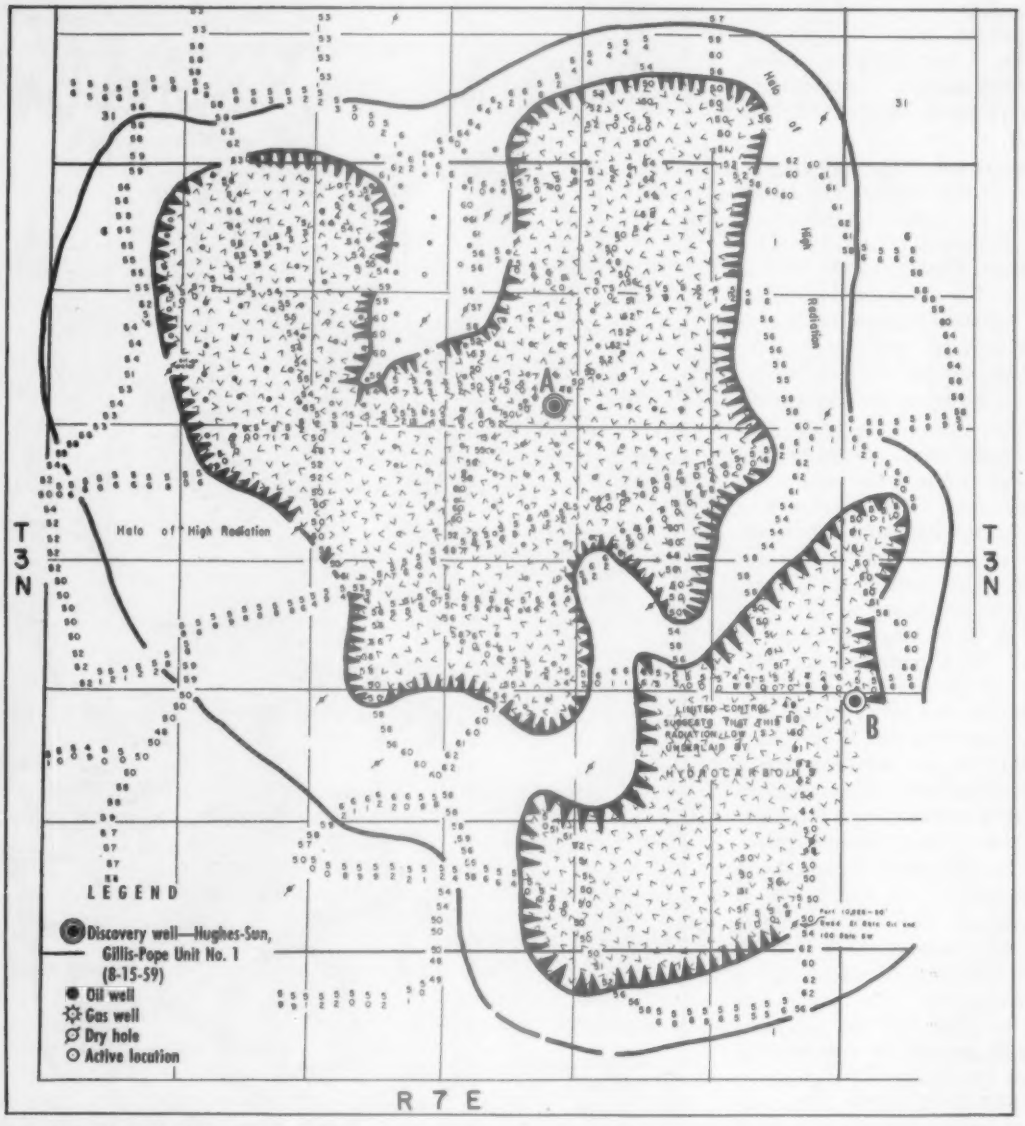
Coverage and cost. In an area traversed by roads, as much as 40 miles of profile can be made in a day. By walking and carrying a portable ionization chamber, about 8 miles a day of profile can be made with a station every 720 ft. The cost of these radiation surveys runs from $5 to $10 per mile of profile.

THIS RADIATION-INTENSITY MAP was made during the drilling of the Little Creek field discovery well, Pike and Lincoln counties, Mississippi. South of the field is an untested radiation anomaly with adequate control. Note recent dry hole at Charter Oil Co. 1 Dunaway (Section 12-3n-8e) between the radiation anomalies. Fig. 1.

... Now—down to cases

Let's examine some actual radiation-survey prospects and see how they turned out. It is common knowledge that many of the larger fields found in recent years have less than 50 ft. of closure. For example, what is now the second-largest field in Mississippi, Little Creek, has less than 20 ft. of counterregional dip, but an oil column of approximately 110 ft.

Actual examples show cheap, fast geophysical prospecting in the form of radiation surveys can be used as an exploration tool in the locating of stratigraphic traps as well as anticlines. Examples of recently discovered fields with only one well are given to let the reader see for himself whether or not future drilling proves the surveys to be a development tool or not.



RADIATION INTENSITY MAP of McComb area, Pike County, Mississippi. Discovery well of this field (A) was drilled on the basis of radiation survey. To the south, another discovery was made at Barnwell-Fernwood 1 Fee, Section 30-3n-8e, B on map. Fig. 2.

Pike County, Mississippi. Little Creek and McComb fields both have less than 50 ft. of closure and an oil column of approximately 100 ft. Both are located within the confines of broad gravity maximum areas; however, neither is outlined as a specific gravity feature. The radiation survey on which the Little Creek map (Fig. 1), is based was made before there was a producing well in the county. It was made in 1958 while the discovery well for this field was drilling. Note how closely this radiation anomaly delineates the productive area from the nonproductive area in a field that is noted for offsetting dry holes.

The radiation survey for McComb field (Fig. 2) was run by M. E. Douglas for Willie Hughes and John Noble, who watched the development of Little Creek field in conjunction with the radiation survey. The discovery well for McComb was on a Sun Oil Co. farmout in 1959. It was drilled on the basis of this radiation survey, not on the basis of gravity, seismic, or subsurface.

It's Just Another

It should be pointed out that these extremely versatile surveys must be looked upon as another tool to be used in conjunction with all other geophysical and geological data, and not necessarily a means to an end.

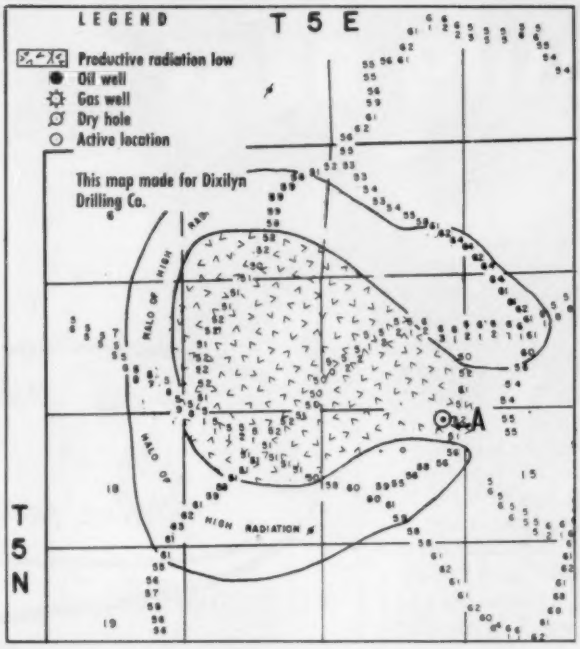
It will be noted on examination of the McComb map, for instance, (Fig. 2), that a few of the poorer producing wells on the extreme north side of the field lie within the halo of high radiation. The careful observer will also note that there are just about as many dry holes as producers in this area. There are no producers outside the halo. This particular example merely points up that this or any other

geological or geophysical method cannot pin point beforehand individual dry holes and producers that offset each other within an anomaly. With the exception of this one small local area, this survey was able to predict whether offsetting forties would produce or at least contain oil or not.

Another case. South of McComb field, the Barnwell-Fernwood 1 Barnwell was completed in October 1960 (A on Fig. 2). This well is on the eastern edge of a poorly defined radiation anomaly. Future drilling will prove or disprove whether this area is underlain by hydrocarbons.

And another. An area with only one producing well within the radiation anomaly is shown on the Little Springs map (Fig. 3). This radiation survey was the tool used for locating the discovery well, Shortridge et al. 1 Board of Supervisors, completed September 6, 1960. The conformation undoubtedly depends upon subsurface and possibly gravity to locate the offset. Future drilling will tell whether or not this $500 survey would have saved a $35,000 dry hole and revealed a location for a producer.

Exploration. A real test of radiation surveys is offered for all to see in the radiation-intensity map of Little Creek field and adjacent area (Fig. 1). To the south is an untested radiation anomaly with adequate control. If this or any one of the other three radiation prospects marked on the map outlines a future



ANOTHER MISSISSIPPI DISCOVERY credited to radiation survey is Shortridge et al. 1 Board of Supervisors, 16-5n-5e (A on map), now named Little Springs field. This one is in Franklin County. Fig. 3.

producing area, it would seem reasonable to assume that radiation surveys do have a place in both exploration and in development of oil fields.

This probably will not be the case, though. A radiation survey can be made in one day by one or two men; it will cover an area that would take 2 or 3 months for a seismic party of 10 to 20 men, or a month or more for a gravity crew.

Thus, people in charge of exploration should recognize:

- Radiation surveys and related geochemical surveys are fast and economical.
- They therefore should be used as a reconnaissance method.
- They should be supplemented where applicable with subsurface, gravity, and seismic work.
- A direct, inexpensive method of oil exploration is **not** impossible.

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Workover turns West Texas oil well into good gasser

A WORKOVER WELL in northern Tom Green County, 12 miles north of San Angelo, West Texas, flowed 2,400 M.c.f.d. and 40 bbl. of condensate. This success is E. B. German & Sons 1-A Eliza M. Baker.

The well is producing from Caddo at 6,437-57 and 6,372-82 ft. The well was previously completed in 1958 as a Caddo oil well from perforations at 6,369-81 ft. Location is in Section 3, GC&SF Survey.

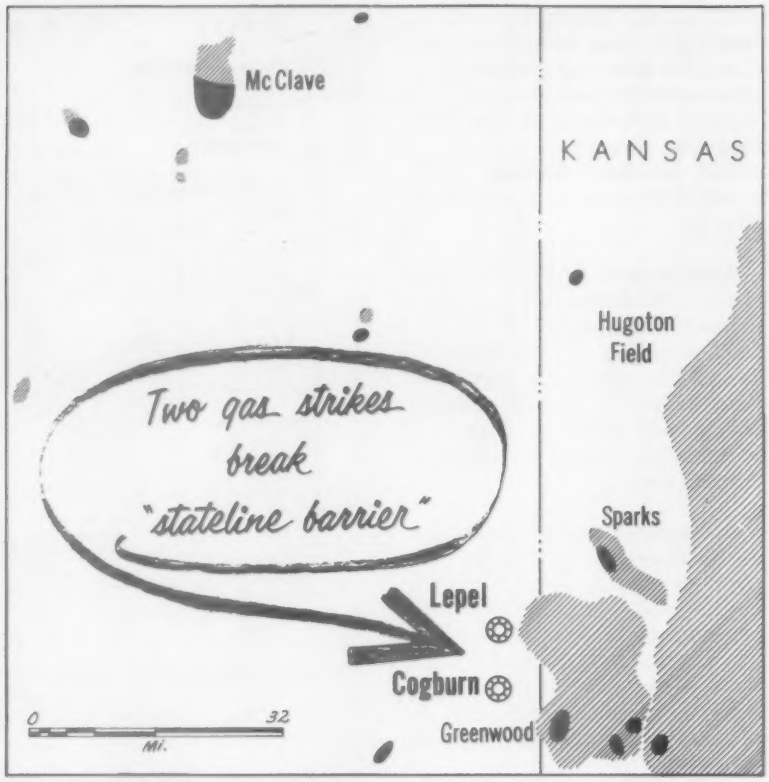
Andrews County. Santiago Oil & Gas Co. completed 1-14 University, 12 miles southwest of Andrews, flowing 210 bbl. of 41°-gravity oil per day on 16/64-in. choke. Flow was from perforations in the Fusselman Siluro-Devonian at 7,950-60 ft. Location is in Section 14, Block 11, University Lands Survey, ½ mile east of Ellenburger production and 1 mile north of Clearfork production.

Pennsylvanian discovery finaled in Texas' Upton

A Pennsylvanian discovery was completed in Adamc-Devonian field, Upton County, 4 miles northeast of Crane in West Texas. The well is Gulf Oil Corp. 32-C McElroy Ranch Co.

The well flowed 227 bbl. of 42°-gravity oil per day from perforations at 8,733-48 ft. Gas-oil ratio is 2,596:1. From Devonian perforations at 10,440-10,507 ft., the well flowed 180 bbl. of oil plus 116 bbl. water in 24 hours through 24/64-in. choke. It's in Section 183, Block E, CCSD&RGNG Survey.

NW corner of Anadarko basin adds gas strikes



ONE OF THE HUGOTON EMBAYMENT'S forgotten corners is Baca County, southeastern Colorado. Two recent discoveries should place this remote section of the Anadarko basin in its proper shelf. Fig. 1.

BY ROBERT J. BEAMS
Independent geologist, Dallas

TWO RECENT discoveries which should focus more aggressive attention on the extreme northwestern corner of the Hugoton embayment of the Anadarko basin are Horizon Oil & Gas Co. 1-22 C. V. Cogburn and 1-10 Lepel in Baca County, southeastern Colorado.

The Cogburn well is located in C NW NW 22-33s-42w. It was dually completed last fall in the Topeka and upper Morrow sands of Pennsylvanian age. Calculated open flow from the Topeka at 3,031-56 ft. was 3,400 M.c.f.d.; from the upper Morrow flow was 7 M.M.c.f.d. from 4,674 ft.

The 1-10 Lepel well is in C NE NE 10-32s-42w. It was completed early this year flowing 2,200 M.c.f.d. from Topeka at 3,324-32 ft.

Cogburn's worth. The 1-22 Cogburn well is a highly significant discovery, being the first Morrow sand producer in the county and 8 miles northwest of the nearest well in that zone. The electric log has not been released by the operator, but it shows 60 ft. of net porous upper Morrow sand development in three members.

The 1-10 Lepel well is 14 miles west and northwest of nearest production, opening up an area of great potential. Both these discoveries "upset the applecart," for many geologists who have written this area off as being unfavorable for production even though the stratigraphy is comparable to the nearby fields in Kansas and Oklahoma. A few dry holes scattered through a big area have been sufficient to condemn the possibilities.

Location. Eastern Baca County, Colorado, is within the Hugoton embayment of Anadarko basin. This area is immediately north of the Keyes gas field of Cimarron County, Oklahoma Panhandle, and near the western portion of Greenwood and Sparks field of Morton and Stanton counties, Kansas.

Economics. Of eight gas and oil-producing zones in these nearby fields, the two which predominate and are the source of greatest profits are the Greenwood (Topeka and Lecompton) and the Keyes Morrow.

In Greenwood field, which comprises 260 sq. miles, the average well produces from 60 ft. of net pay at a depth of 3,200 ft. in Virgil limestones, and will return a net operating profit of $516,000 for a well cost of $32,000. This amounts to a profit-to-cost ratio of 16:1 with a 16.5-month payout.

In Sparks field, which comprises 21 sq. miles, the average Keyes sand well produces from 40 ft. of net pay at a depth of 5,200 ft., and will return an operating profit of $1,144,000 for a well cost of $75,000. This amounts to a profit-to-cost ratio of 15:1 with a 17.5-month payout.

The pay zones between the Greenwood and the Keyes generally do not encompass large productive areas, but may locally be of importance. For example, the upper Morrow sand (Purdy) in the Interstate field, which lies within Greenwood field and comprises 3,200 productive acres (5 sections), will produce 20,000,000 bbl. of oil ultimately.

Geology. Within this portion of the Hugoton embayment, the regional dip is to the east-northeast at an average rate of 30 ft. per mile. In the upper and middle Pennsylvanian, the gas-productive zones are porous limestones within an interval of 1,500 ft. with alternating shales. In the lower Pennsylvanian, the oil and gas producing zones are sandstones within an interval of 500 ft. which is interbedded with shales. The underlying Mississippian and Ordovician section is predominantly limestone. Their porous members are potentially productive, but relatively unexplored.

Hydrocarbon accumulations in all zones above the basal Pennsylvanian (Keyes sand) are trapped by either permeability variations or by updip pinchout of porosity. Each

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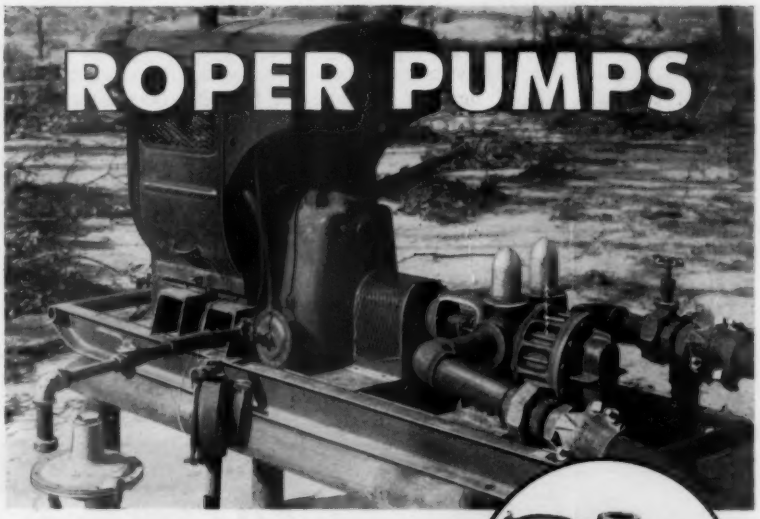

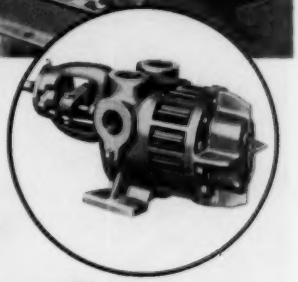

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pay zone has a distribution controlled by its own peculiarities. Due to their multiple nature, the success ratio of the area should be high. The Keyes sand has a blanket development, requiring structural closure for gas entrapment.

Distinctive characteristics. The hydrocarbon accumulations are predominately dry gas with subnormal pressures, making recognition of the presence of pay during drilling very hard. Seven wells unknowingly penetrated the shallow gas pays of Greenwood field before its discovery, and all are within its present productive area. Physical testing of potential beds has been necessary to fully evaluate their productive character. Present electrical - logging methods combined with drill-stem testing are giving much-improved interpretation, but all dry holes drilled previous to 1960 must be most closely inspected for unevaluated possibilities.

Exploration. The determination of structural closure such as necessary for Keyes gas accumulation has not been aided by seismic surveys because the companies have used reconnaissance shooting patterns and inappropriate techniques. Additional test wells in this sparsely drilled area of Baca County, when coupled with appropriate seismic surveys, will contribute materially to successful exploration due to a much improved knowledge of the structure and stratigraphy.

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Alberta has significant find

ALBERTA has one of the most promising oil discoveries in many months at Hunt Oil Co. et al. 16-27 Buffalo Lake on LSD 16, 27-39-21w4, 2½ miles northwest of Erskine D3 oil field, and 35 miles northeast of Red Deer city.

This is one of the best strikes on the Alberta plains in some years. Initial drill-stem test of the D3 reef of Devonian age was of the top 10 ft. of the zone. Oil flowed at the rate of 50 bbl. hourly. Three other tests were run, with estimated rates of 75 bbl. per hour. The reef zone hasn't been fully drilled into but indications are that at least 110 ft. of water-free oil-bearing pay are present. Operators are now logging the pay.

Separate reef. The Buffalo Lake discovery is near Erskine field, but it is on an entirely different reef structure. The top of the pay at the Hunt well is some 70 ft. below the oil-water contact at Erskine field.

Although some work in this area has been done in the past few years, the reef hunt has never paid off well. This new discovery is expected to refire some reef interest on the plains. Many companies will be taking another look at their geophysical interpretations.

New oil found in Southeast Kansas area

Oil production was reported in an old gas field of southeastern Kansas. Hedges Drilling Co. have a discovery in 24-33s-16e, Montgomery County, inside an old Mississippi lime gas field opened in 1910.

The well is making 20 bbl. of oil per day or more from Peru sand at 500 ft.

Drillers test Kentucky's Fleming County

In Fleming County, Kentucky, a wildcat is being drilled by Parker and Johnson at 1 Stephens and Barber Brothers.

Test is in 17-U-71, 8,150 ft. FWL, 1,085 ft. FSL. At last report, drilling was in progress below 150 ft. with elevation recorded as 736 ft. This is the first reported drilling in Fleming County for some years.

A shallow wildcat for Nicholas County has recently been drilled. Test is that of Pleasant Valley Oil Co. 1 Ray Flora in 10-W-67, 8,850 ft. FEL, 9,650 ft. FSL. A slight show of oil was reported from 85 to 89 ft. Total depth is 120 ft. Rig has been moved from location and well is shut down pending decision to treat or not.

New Ohio field gets first offset

In Ohio, the first offset to a new pool discovery in Smith Township, Mahoning County, is a producer. This test, 1 N. Hartzell, Section 5, about ½ mile west of the discovery well, 1 R. Miller, had a natural gage of 180 M.c.f.d. in the Clinton sand at 4,844-4,907 ft. It tested 2,003 M.c.f.d. with a rock of 1,425 psi. after fracture.

The operator, Atlas Exploration Corp. has another offset going in Freedom Township, Portage County.

In northwestern Canaan Township, Wayne County, Dalton and Hanna scored with a good producer in the Newburg horizon. The 1 H. Thompson, Section 17, tested 300 bbl. of oil with 599 M.c.f.d. after fracture. Natural production was 25 bbl. from the pay at 3,027-48 ft.

Norman Navy Base strike tests its third pay zone

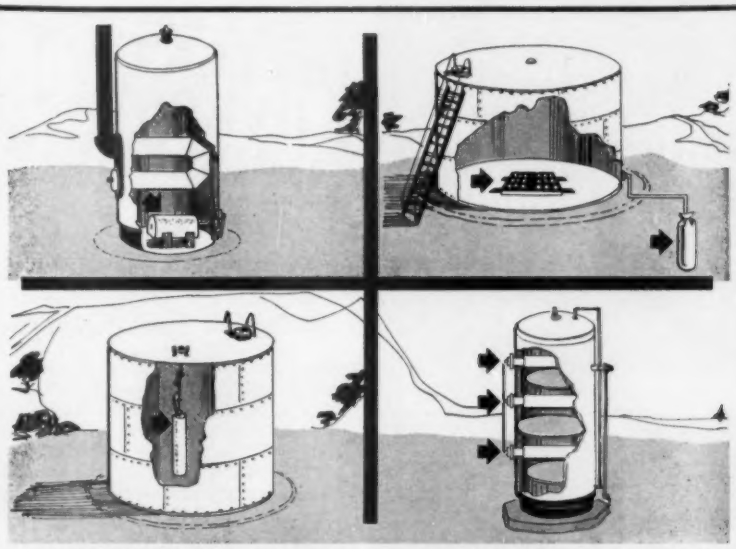
Three oil zones are now apparent at Anderson-Prichard Oil Corp. 1 Navy in NE SW SW 5 - 8n - 2w, Cleveland County, Central Oklahoma.

A test at 8,761-73 ft. flowed oil in 50 minutes with no estimate of flow reported. Previous tests got oil in the Bromide at 8,016-32 ft. and in Tulip Creek Ordovician at 8,310-20 ft.

Enville. Pan American Petroleum Corp. completed 1 Locke in C NE NW 31-6s-3e, West Enville field, Love County, extreme southern Oklahoma. The well flowed 30 bbl. of condensate in 4 hours through 12/64-in. choke and 2,600 M.c.f.d. from perforations in basal Oil Creek Ordovician sand at 10,843-59 ft.

Arkoma. Two zones are being tested at a discovery in Haskell County, southeastern Oklahoma. Mobil Oil Co. tests flowing gas in Spiro and Cromwell sands at 1 Quinton unit in C SE NE 11-7n-19e, near the old shallow Quinton gas field. Gas flowed at the daily rate of 6,338 M.c.f.d. through 1-in. choke from Spiro perforations at 5,862-5,920 ft. From Cromwell at 6,305-33 ft. it made 2,940 M.c.f.d.

In North Mellette field of McIntosh County, Hall-Jones Oil Co. completed 1-A Wood in SE SE NE 17 - 9n - 15e, extending the field northwest. From Misener at 4,556-66 ft. and Hunton Siluro-Devonian at 4,914-24 ft. the well flowed 2,529 M.c.f.d. through ⅜-in. choke and 3,010 M.c.f.d. The Cromwell at 4,290-4,316 ft., previously flowed 20,162 M.c.f.d.



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Arkoma basin will get important wildcat test

A 6,000-ft. wildcat is slated for Pushmataha County in southeastern Oklahoma's portion of the Arkoma basin. Apache Corp. of Tulsa will drill the 1 Dumm unit in C NE NE 22-2s-16e, 2 miles north of Kosomo and 10 miles north of Antlers.

This wildcat is 8 miles northeast of the first producer for the county at J. F. Stephenson and King-Stevenson Oil Co. 1 Brame in C NW SE 15-3s-15e. That well recently flowed 500 M.c.f.d. during completions test from perforations at 3,062-3,710 ft. to open first gas production in the Ouachita Mountains province of the state.

Latimer County. Sinclair Oil & Gas Co. will drill a 3,000-ft. hole in New Potato Hills field at 1 Helen Mattice, N½ N½ S½ NW 33-3n-20e, 1 mile east of the discovery well for this new Arkoma area. Sinclair completed 1 Reneau in C SE NW 32 last year flowing 1,850 M.c.f.d. from Big Fork chert at 2,340-2,410 ft.

Early in January, the Oklahoma Corporation Commission denied an application by Sinclair for 640-acre spacing in this sector since testimony in the hearing on the request indicated "that the area is highly faulted and complex, and that it is extremely difficult at this point to determine the areal limits of the Big Fork chert." The commission stated that "it is too early at this stage of the development for an intelligent determination of the proper-sized drilling and spacing units."

Sinclair will drill another wildcat to 3,000 ft. 4 miles southeast of Potato Hills field. The 1 Sam Herrick is in NW NE SW 11-2n-20e, 2 miles north of Kiamichi.

New book available from California office

The Department of Natural Resources, Division of Oil and Gas, San Francisco, has released a new book of extreme interest. California Oil and Gas Fields, Part 1, of the San Joaquin - Sacramento Valleys and Northern Coastal Regions, gives a detailed report on all producing areas in this section of the state. Of particular interest is the field-by-field description of northern California gas-producing areas, now one of the nation's hottest drilling plays.

Historically, there have been four major areas or basing of oil or gas production in California. These are Los Angeles, San Joaquin - Sacramento (the Great Valley), Ventura and Santa Maria. Recent years have brought two new valleys, Cuyama and Salinas, into lesser but still considerable importance.

Oil occurs in the San Joaquin Valley largely in the Pliocene, Miocene, and Eocene with lesser amounts in the Pleistocene and Oligocene, and very minor amounts in the Cretaceous and Jurassic. Dry gas is the only production of the Sacramento Valley, although a recent well in Winters gas field may have discovered commercial oil production from Cretaceous. Gas occurs largely in the Eocene and Cretaceous with some in the Pliocene and Miocene. In the San Joaquin Valley, dry gas is of minor importance, being found primarily in the Pleistocene and Pliocene rocks.

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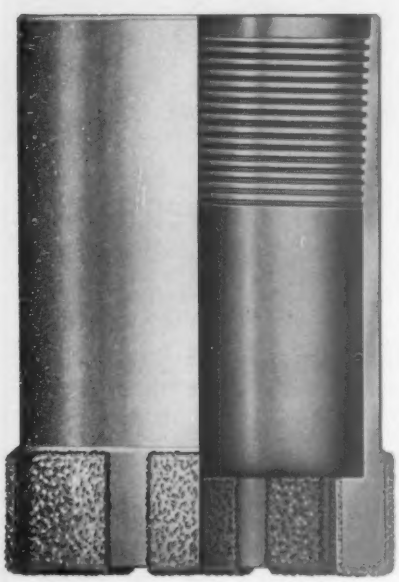

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RUMORS are buzzing in North Dakota of a Madison discovery 5 miles northeast of Montana's Dwyer field.

North Dakota gets first big strike

NORTHWESTERN North Dakota may have a new Madison Mississippian oil field if Hunt Oil Co. completes its 1 Price successfully. The important wildcat, first significant strike of 1961 in North Dakota, is located in C SW NE 29-159n-103w, Williams County.

Reports state that free oil was recovered on a drill-stem test of the Madison. Total depth of the Hunt well is 7,736 ft. but no other data are out. Location is 20 miles southwest of Writing Rock field, now abandoned. There has been no drilling for 20 miles to the east and more than 35 miles to the south. Also there has been no drilling between Hunt's well and Dwyer Madison field in Montana.

Late report. Hunt recovered 470 ft. of free oil on drill-stem test. This recovery also included 36 ft. of mud, 94 ft. of highly gas-cut oil and mud emulsion, 94 ft. of slightly mud-cut oil and 94 ft. of salt water. The test lasted 5 hours. Shut in pressure was 3,400 psi. after 1 hour. A test is now being run at 7,742-86 ft.

Texas' Fort Trinidad adds Glen Rose pay

The Glen Rose horizon is proving productive in a new discovery in Fort Trinidad field, in southwestern Houston County, eastern Texas. Previous production in this field has been from Woodbine sand and Buda and Georgetown lime.

The new production is in Pure Oil Co. 12 W. T. Bruton Estate on the southeast side of the field. Pay is perforated at 10,576-94 ft. in hole drilled to 12,810 ft. Early tests through ¼-in. have resulted in a flow of 11 bbl. per hour with pressure of 1,200 psi.

Kentucky wildcat is dry

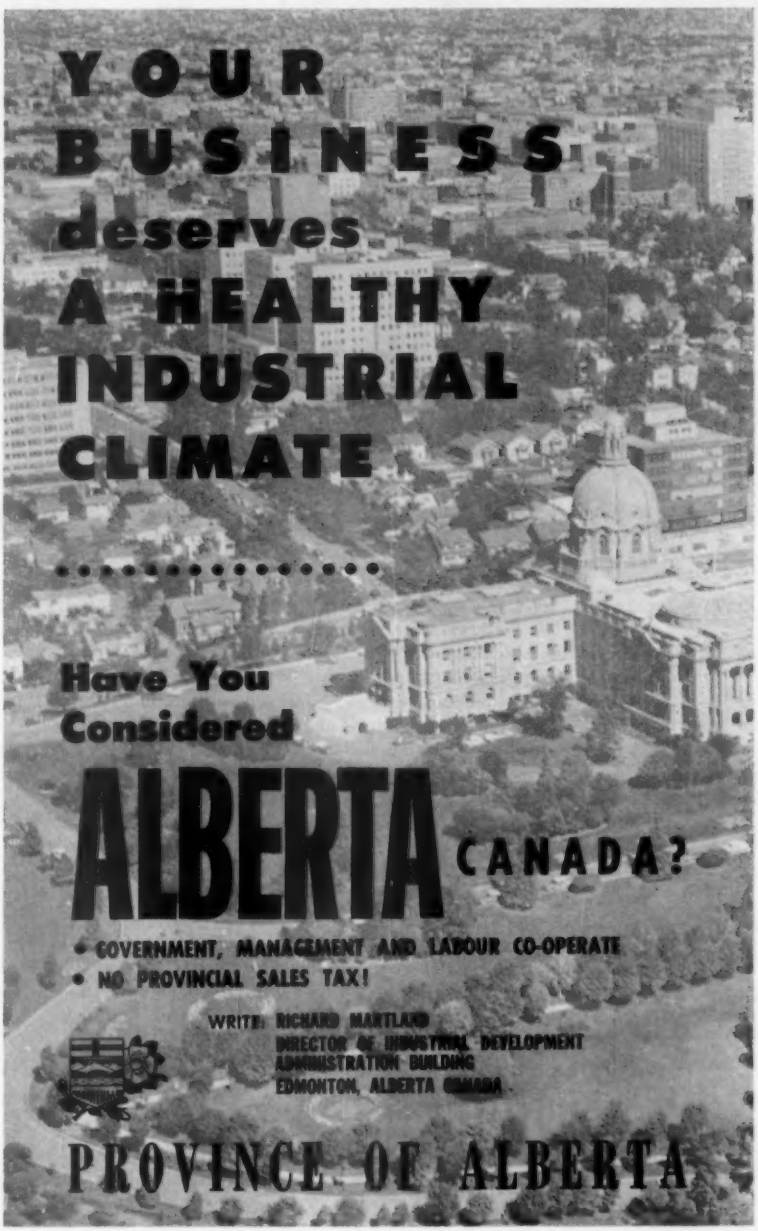
In eastern Kentucky a wildcat in Lewis County has ended in failure. R. G. Howes has plugged and abandoned 1 Goldie Gilliam. Located 6,850 ft. FWL and 4,700 ft. FSL of N-74, test encountered Berea (Mississippian sand) at 165 ft. Devonian black shale 840 ft. and Corniferous limestone at 1,055 ft. Well was carried to a total depth of 1,070 ft.

Houston has two-zone find

A dual-zone dry gas discovery within the city limits of Houston revives the old South Clinton field, previously oil - productive but now depleted.

The new well, drilled by Acco Oil & Gas Co., is the first permitted under a recently enacted city ordinance. It is on the northeastern edge of the city.

The new gas production is from shallow Miocene sands, perforated at 2,495-99 ft. and 2,449-53 ft. The field's original oil production,



opened in 1951, was from a 6,450-ft. Vicksburg sand. Two wells were completed in that sand.

Grayburg well finaled in Reagan County, Texas

A Grayburg Permian discovery is reported in southeastern Reagan County, West Texas, 3 miles northeast of Big Lake. The well is Texas Gulf Producing Co. 1 Schwartz.

On potential test the strike made 113 bbl. of oil and 20 bbl. water in 24 hours. Flow is from perforations in the Grayburg at 2,719-35 ft. Location is in Section 9, GC&SF Survey, 1½ miles northeast of Northeast Price Grayburg field.

Scurry County. Texaco Inc. has Strawn Pennsylvanian production in northern Scurry County, 16 miles northeast of Snyder.

The 249 P. L. Fuller, NCT-1, pumped 137 bbl. of 37.1°-gravity oil daily from perforations at 7,290-7,300 and 7,316-26 ft. in the Strawn C sand. Location is in Section 617, Block 97, H&TC Survey, 1½ miles east of Fuller field and 1½ miles southwest of Cogdell field.

Texas Panhandle. A Douglas Pennsylvanian gas discovery was completed in Lipscomb County by Ambassador Oil Corp. The 1 Max A. Blau, 8 miles southeast of Booker and about 3 miles west of Kiowa Creek field, flowed 5,402 M.c.f.d. through ¾-in. choke from perforations at 5,890-5,903 ft. Location is in Section 941, Block 43, H&TC Survey.

Gas strikes pace Sooner drilling

GAS dominates Oklahoma's exploratory news this week. In Beaver County, Mayflow Oil Co. reworked 1-36 Kerns in C NE SW 36-2n-20eCM, getting 6,890 M.c.f.d. from Chester lime Mississippian at 7,690-7,715 ft. The Morrow at 7,213-25 ft. made 10 bbl. of oil per day on pump.

James F. Smith 1 Mendenhall, NE NE SW 21-4n-20eCM, Beaver County, flowed 2,550 M.c.f.d. from Chester at 6,475-6,577 ft. Jennings and Clogg 1 Bedell, C NE SW 23-1n-27eCM, flowed 3,690 M.c.f.d. and condensate from Morrow perforations at 8,482-8,556 ft. Russell Maguire 1 Blakemore, C SE NW 12-4n-22eCM, flowed 156 bbl. of oil in 6 hours from 5,500 ft. in the Marmaton Pennsylvanian.

Harper County. Sinclair Oil & Gas Co. completed a discovery in Northwest Lovedale field at 1 Yauk, C NE SW 22-28n-21w. The well flowed 7,592 M.c.f.d. and 36 bbl. condensate in 12 hours through 43/64-in. choke from the Morrow Pennsylvanian at 5,718-42 ft. Blackwell Zinc opened oil production at Northeast Gate Lake in the Cherokee Pennsylvanian lime. The well flowed 31 bbl. of 38°-gravity oil per hour through 24/64-in. choke from perforations at 7,149-79 ft. Well is the 1 Strawn, C SW NE 26-28n-26w.

Major County. Pan American Petroleum Corp. 1 Hollenbeck, C SW NE 31-21n-16w, east of West Chester gas field of Woodward County, flowed 1,788 M.c.f.d. from Chester perforations at 7,813-36 ft.

Dewey County. Sinclair extended West Valley Center field at 1 Kunc, C NE SW 12-17n-18w, eastern

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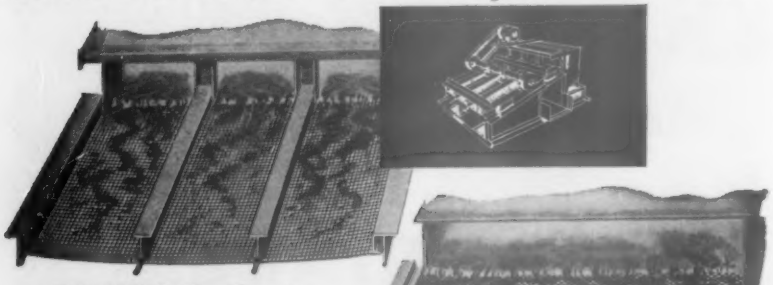

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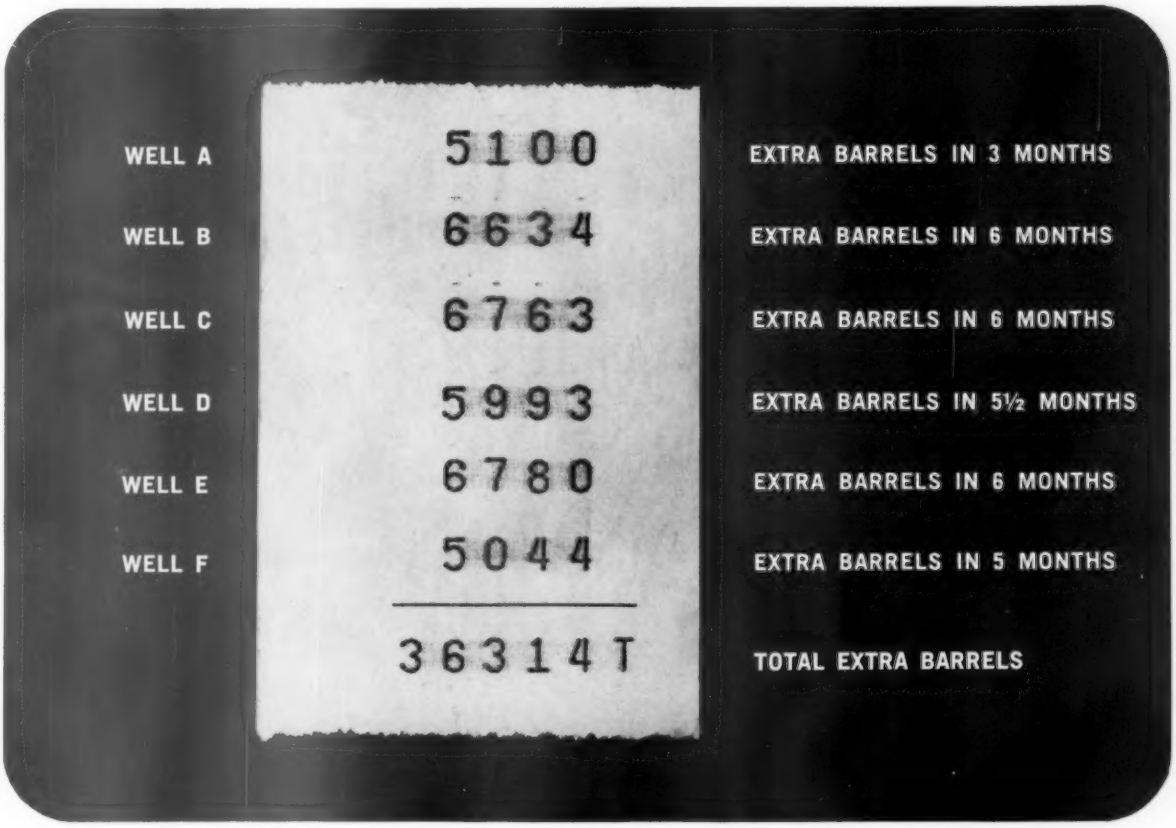

This operator got 36,314 barrels of extra oil from six wells within six months after they were fractured by Dowell. Total service costs for the six treatments averaged only $2931.79 per well. The extra oil produced during the first six months, as a result of fracturing, cost less than 49 cents per barrel. Additional production after the first six months will be almost clear profit.

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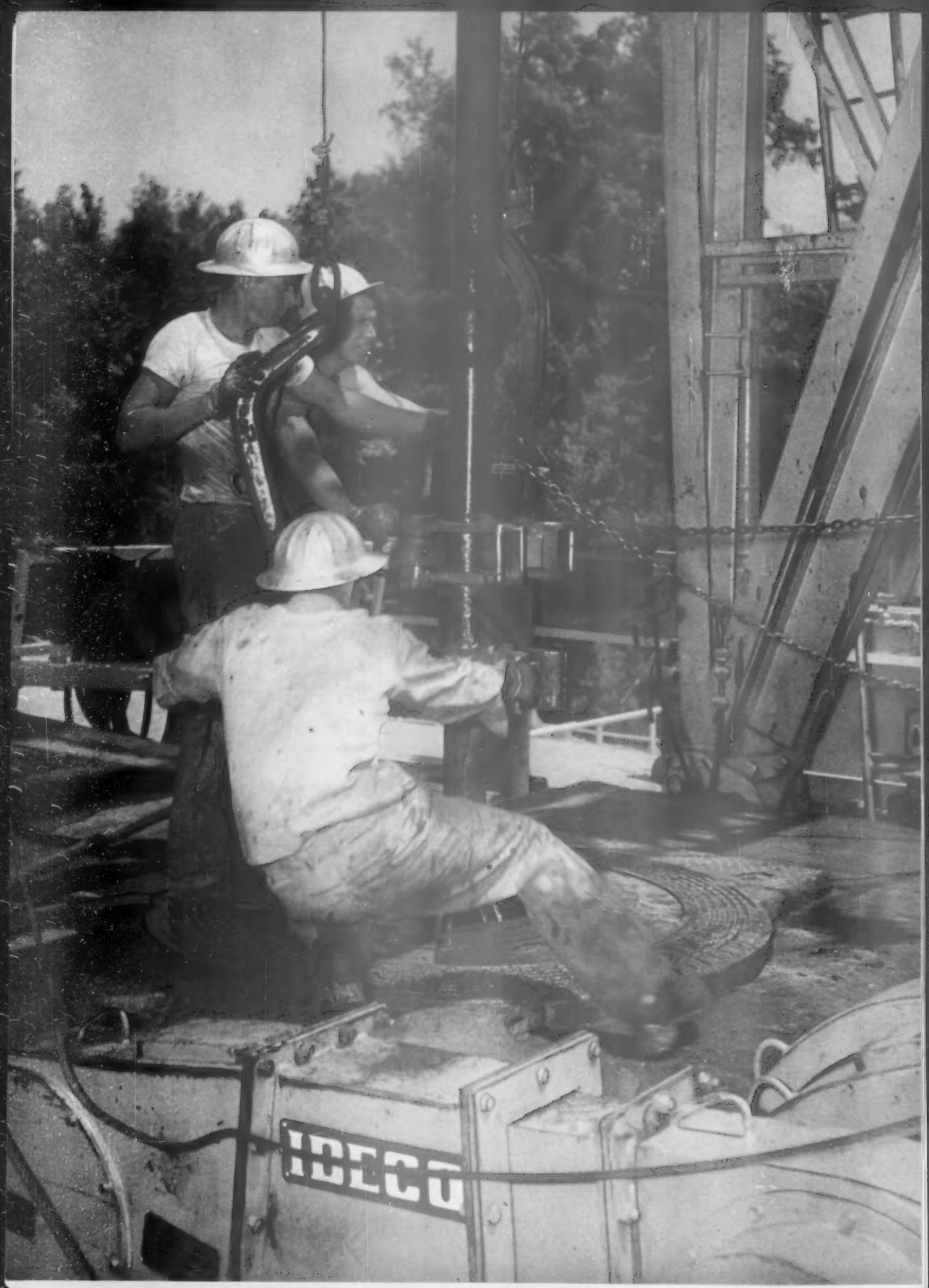
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J&L Grayloc® Tubing is another example. It's held the highest well pressures anyone's hit so far. The Grayloc joints are sealed tight by an independent ring. And the heavy, square threads take the strain of make-up many times without impairing the seal.

On severe, variable drilling operations, J&L Buttress Thread casing gives you joints as strong as the pipe itself. You can put more casing in the hole faster with Buttress Thread casing. You get easier stabbing and rapid spinning, and use fewer power strokes to tighten the coupling.

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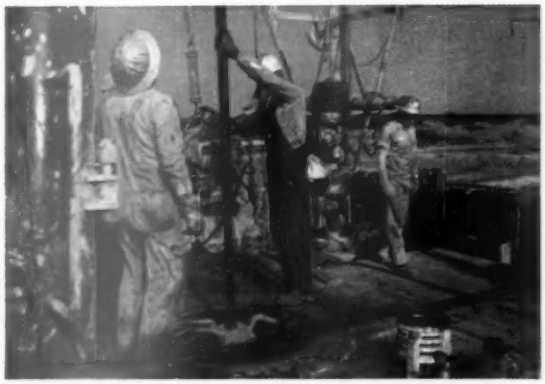
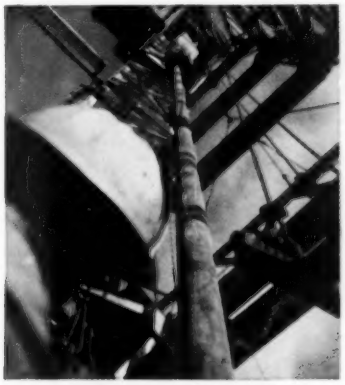
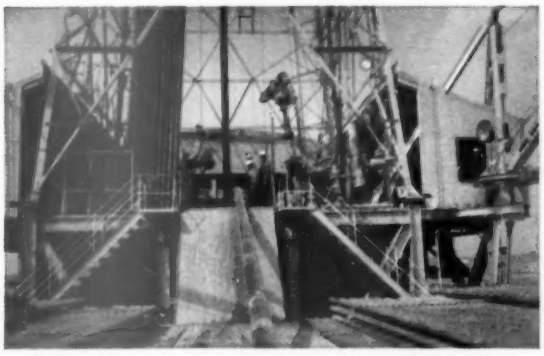


Sun Oil Company knows that J&L Grayloc® Tubing provides positive leak resistance at high pressures. J&L Grayloc Tubing can be run again and again. The tubing joint has an independent sealing ring that will hold against the highest well pressures yet encountered.



J&L Extreme Line* casing providcs maximum joint strength and allows up to 50% higher running speeds than for conventional API T&C casing in the same size and range length.



At Bell Isle Corporation No. 43 well, southwest of Morgan City, La., Sun Oil used 5,813 feet of J&L Buttress Thread casing in the top sections of the 9⅝" casing. "The high strength of J&L Buttress Thread casing was used so a much longer and heavier intermediate string could be run," the drilling superintendent reported.

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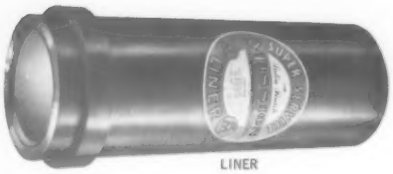
The Mission  Mission

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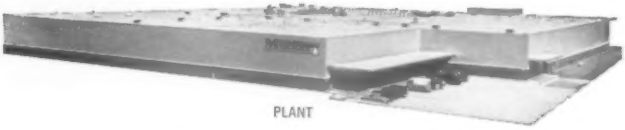
are all designed and made in our modern  to work together to cut your drilling costs.

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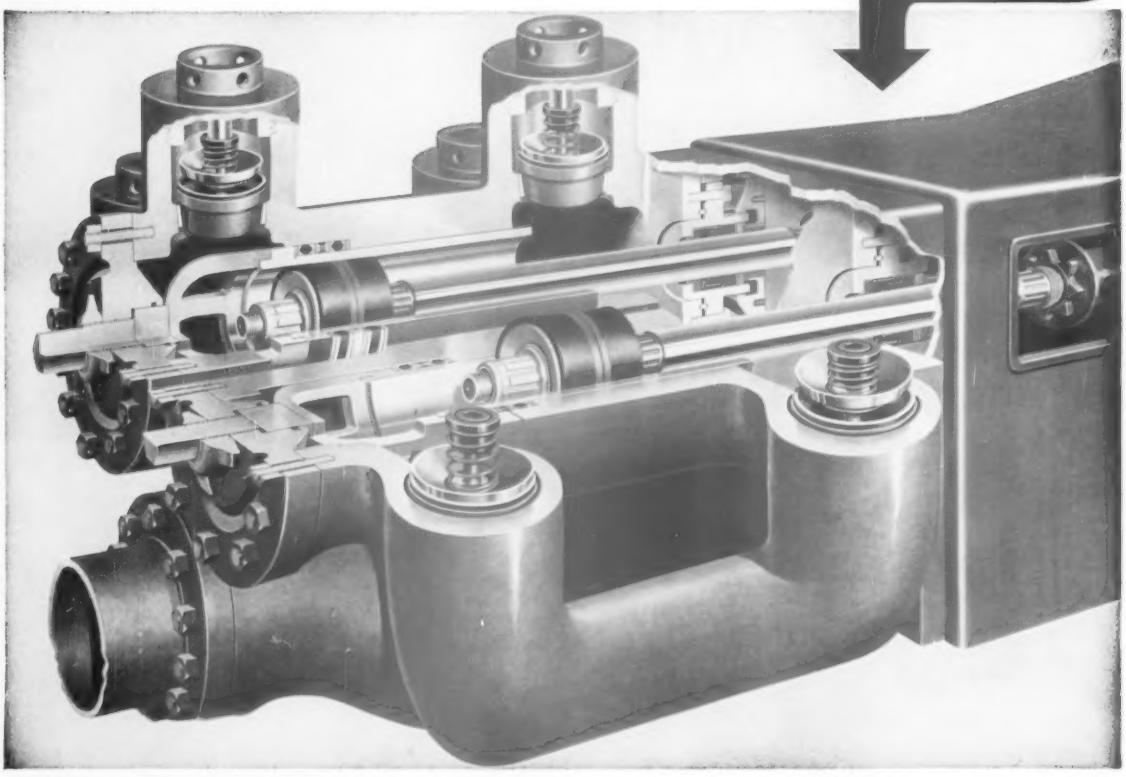

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Dewey County. The Oswego made 12 M.M.c.f.d. on drill-stem test at 9,148-9,220 ft.

CORRECTION

John C. Kinard

The Oil and Gas Journal incorrectly stated that John C. Kinard is an exploration and development geologist for Phillips Petroleum Co. at its Billings, Mont., office, in the February 6 issue, p. 172, "Geologists appraise Tule Creek area." Kinard was **formerly** with Phillips Petroleum Co., but is now a consulting geologist in Billings.

Gas hunt in Arkoma yields discovery

UNABATED gas exploration on the northwestern Arkansas side of Arkoma basin has paid off with another good discovery in Pope County.

It is 2½ miles northwest of Dover where Gulf Oil Corp. has opened "New Hope" field with a well rated good for 3,089 M.c.f.d. of gas from Casey sand at 3,063-76 ft.

Discovery well, 1 Ida Jones, in 18-9n-20w, is 5½ miles west of Dover field, and 6 miles east of Ross field. It is 9 miles north of Russellville.

Hole is plugged back to 3,198 ft. from a drilled depth of 5,285 ft.

In the meantime, final tests have been made in J. M. Huber Corp.'s new dual-pay discovery well at Scranton, about 25 miles west in northern Logan County.

This well, 1 Mabry, is completed in the Orr sand for open-flow potential of 5,300 M.c.f.d. of gas, and the Woolsey and Hale zones for 1,360 M.c.f.d. Orr sand is perforated at 6,745-74 ft., and the two lower sands in a series of intervals from 7,013 to 7,373 ft.

Location of this discovery, named Scranton field, is nearly 3 miles northwest of Scranton, and 7½ miles southwest of Spadra field.

Athletic Mining & Smelting Co. has a possible gas well in the shallow lower Alma sand in a 6,200-ft. Hale sand wildcat (1 Wilson) just ½ mile east of Fort Smith, in Sebastian County, on the far-west side of the state. The shallow sand, at 2,009 ft., had a gas flow of 775 M.c.f.d. It is being passed up for the time being. Location is a little less than 2 miles northwest of Messard field.

Discovery Wells

CALIFORNIA

Colusa County:

Gulf Oil Corp. 1 F. Stapp, et al., center SE¼ 2-14n-1w. Flowed 4,378 M.c.f.d. through ¼-in. choke 6,968-7,022 ft. with flowing pressure of 1,928 psi. TD 8,000 ft. New pool discovery in West Grimes field.

WESTERN CANADA

Alberta:

Whitehall et al. 16-32 Pembina, LSD 16, 32-47-2w5. Cardium oil discovery. TD 4,325 ft.

Cal-Standard 4-2 Meekwap, LSD 4, 2-65-19w5. Beaverhill Lake oil discovery. TD 9,700 ft.

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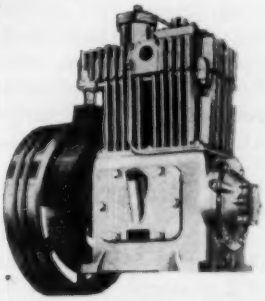

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Another Bechtel Takes Over

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THE NEW PRESIDENT of Bechtel Corp. is a young engineer whose background includes a long stint with crews which laid hundreds of miles of pipeline.

Steve Bechtel, Jr., is the third member of his family to head the company. The others were his father, S. D. Bechtel, who continues as chairman of the board, and his grandfather, W. A. Bechtel, who founded the organization in 1898 with a team of horses, some grading equipment, and a lot of foresight.

For young Bechtel, winning the president's job involved a lot more than just having the Bechtel name.

Besides 5 years of work on pipeline right of ways, it has meant several years of working out of the San Francisco home office on other phases of the company's world-wide construction and engineering program.

Steve Bechtel, Jr.
. . . a third-generation president.

Experience . . . The 35-year-old Bechtel literally grew up in the construction business. He spent the first 2 years of his life in a railroad outfit car which served as home while S. D. Bechtel directed a railroad-construction project in the Pacific Northwest.

The young Bechtel's first work with the company was with field crews during his high-school vacations. In 1948, he started full-time as a field engineer on a pipeline spread in Texas. Later he held a variety of pipeline jobs in the U. S. and Canada. His posts ranged from job engineer to spread superintendent.

Career decision . . . There was a time when Bechtel didn't know whether he would join the Bechtel team.

"During college years," he recalls, "six of us had set up an equipment rental business and I debated seriously whether to go into business for myself or join Bechtel."

He went with the company soon after graduation from Stanford's School of Business with a master's degree in business administration.

Bechtel's first 2 years of college were spent at the University of Colorado. He moved to Purdue University, where he took his BS degree in civil engineering. During World War II, he served in the Marine Corps.

Executive climb . . . Bechtel went to the company's home office in 1952 as manager of the pipeline division and became a vice president. Three years later he was elected a senior vice president and served a term as treasurer of the parent company and several subsidiaries.

In 1957 he was named executive vice president, and in 1959 took over as chairman of the executive committee.

The future . . . There have been vast changes in construction work since the day Bechtel's grandfather hitched up his horses. The Bechtel firm, long established as engineers and builders of refineries, chemical plants, and steam and electric-power plants, in recent years has been a leader in the engineering and construction of nuclear-power plants.

The new Bechtel president has no fear that hydrocarbon fuels will be replaced by nuclear energy.

"The increase in demand will be so great that there will be a big need for both regular and nuclear fuels," he says.

▶▶▶ Personals

Clarence L. Moody, retired Ohio Oil Co. geologist, and now Houston consultant, has been named 1961 recipient of American Association of Petroleum Geologists' Sidney Powers memorial medal. Moody is an honorary member of the association and served as its president in 1950.

Tom Pace, Atlantic Refining Co., has been elected president of Wyoming Landman's Association. Other officers are **Larkin O'Hearn,** Sinclair Oil & Cas Co., first vice president; **Bill Hollander,** Shell Oil Co., second vice president; **Jim Beasley,** Lion Oil Co., secretary; **John Dobos,** True Oil Co., assistant secretary; and **Ed Fiest,** Tennessee Gas & Oil Co., treasurer.

George J. McLeod, chief geologist for Samedan Oil of Canada, Ltd., has been named Canadian division manager. **John R. March,** vice president and general manager of Samedan of Canada, has been transferred from Calgary to Ardmore, Okla., headquarters offices of Samedan Oil Corp., the parent company. **Robert E. Layhe,** production manager of the Canadian division, has also been transferred to Ardmore.

E. H. Burtner, assistant to the vice president, administrative, for Standard Oil Co. of Texas in Houston, has been named northwestern division exploration superintendent in Amarillo, Tex. He succeeds **C. R. Hensch,** who becomes assistant to the vice president, administrative.

Harrison L. Townes, division geologist with Helmerich & Payne, Inc., has been promoted to exploration manager. **Richard N. Knoblock,** district petroleum engineer for Texaco Inc., in Wichita, has joined Helmerich & Payne as chief engineer, production department. **Jay C. Tapp,** executive assistant, has been appointed assistant to the president.

▶▶▶ Personals

R. E. Kreider, petrochemical coordinator for Standard-Vacuum Oil Co., has been appointed manager of Mobil Chemical Co.'s development division.

Glenn H. Curtis, vice president of Stone & Webster Canada, Ltd., has been named vice president and general manager. He succeeds **Leonard L. Youell,** who has retired but will continue as a director.

Richard M. Morrow, New Orleans district superintendent for Pan American Petroleum Corp., has been appointed central division engineer in Oklahoma City.

E. B. Krider, National Cooperative Refinery Association, has been elected chairman of American Petroleum Institute's western Kansas chapter. Other officers are **A. F. Darnell, Jr.,** Halliburton Co., first vice chairman, program; **J. R. Nichols,** Sunray Mid-Continent Oil Co., second vice chairman, membership; **E. M. Solter,** Baker Oil Tools, Inc., third vice chairman, food; **P. B. Horst,** Republic Natural Gas Co., fourth vice chairman, education; **T. R. Smith,** Humble Oil & Refining Co., fifth vice chairman, social; and **J. D. Forsythe,** Cities Service Oil Co., secretary-treasurer.

VERNER

Walter B. Verner has been appointed superintendent of production, Houston operations, for Natural Gas Pipeline Co. of America. He succeeds **Charles R. Worst,** who has resigned. Verner was gas-supply engineer in the company's Amarillo, Tex., production headquarters before the new appointment.

R. J. Lee, connection foreman with Interstate Oil Pipe Line Co., has been promoted to Raceland, La., district foreman. **L. J. Harvey,** Raceland assistant connection foreman, will succeed Lee.

William W. Shaw, assistant manager of Sinclair Pipe Line Co.'s right-of-way department, has been named manager. He succeeds **Fred A. Crane,** who will retire March 1. **Hamilton A. Cade,** right-of-way supervisor, will succeed Shaw.

James V. King, general engineer of Western Gas Service Co., has been named vice president and manager of operations. **B. V. Cowart,** treasurer, has been elected a director. **Walter Uroda** has been named assistant treasurer and **W. Dyer Moore, Jr.,** has joined the company as corporate secretary and attorney.

Thomas M. Thawley has been named manager of European operations for Pipe Line Technologists, Inc. He will headquarter in The Hague. Thawley succeeds **Richard S. Barfield,** now supervising engineer, design, in Houston headquarters.

Corder S. Reynolds, Jr., project engineer with Columbia Gulf Transmission Co., has been named assistant chief engineer. He succeeds **Charles W. Morrow,** who has been transferred to Ohio Fuel Gas Co. as assistant chief engineer of the Columbus group companies. Columbia Gulf and Ohio Fuel are Columbia Gas System subsidiaries.

Wayne Sweet, assistant manager of Texas Gas Transmission Corp.'s Louisiana division, has been named assistant superintendent of the measurement department in Owensboro, Ky.

Charles E. Pliley, supervisor of gas contracting for El Paso Natural Gas Co.'s Rocky Mountain area, has joined Mountain Fuel Supply Co. in Salt Lake City as special representative for gas-purchase negotiations.

W. E. Biggerstaff, sales-development manager in Continental Oil Co.'s Rocky Mountain region, Denver, has been promoted to manager of marketing in the Houston division. He succeeds **John W. McCulley,** recently named assistant manager of marketing for the southwestern region, Fort Worth. **George G. Elwood, Jr.,** has been promoted to manager of marketing operations for the southwestern region. He succeeds **E. G. Hoover,** now Fort Worth division manager of marketing. Elwood had been on special assignment in Houston.

Fred H. Moore, vice president in charge of Mobil Oil Co.'s exploration and producing activities, has been named executive vice president. He will coordinate activities of the marketing, manufacturing, supply and distribution, pipeline, and traffic departments. **H. L. Waszkowski, Jr.,** division vice president in Houston in charge of exploration and producing in the South Texas-Gulf Coast area, will move to New York as vice president of the exploration and producing department. **R. R. Jackson,** vice president of manufacturing and supply, has been named vice president of programs and supply-distribution, a new post. Also, in the exploration and producing department, **E. V. Watts,** division vice president in Denver, has been named division vice president in Houston. **A. O. Detmar,** president of Mobil Oil of Canada, Ltd., will succeed Watts as Denver division vice president. **O. H. Blexrud,** exploration manager in Midland, Tex., will move to Calgary as Mobil Oil of Canada president.

MOORE

WASZKOWSKI

JACKSON

C. E. B. Tothill, engineer with Murphy Corp. in El Dorado, Ark., has been transferred to Shreveport, La., as petroleum engineer.

C. L. Melancon, Jr., senior development engineer at Dow Chemical Co.'s Plaquemine, La., plant, has been named production plant superintendent, polyethylene plant. **Albert Woodward,** senior production chemist, Plaquemine, has been named polyolefin laboratory supervisor.

Personals

BAKER

BROWN

E. R. Baker, general manager of Continental Oil Co.'s petrochemical department, has been promoted to general manager of the research and development department and petrochemical department. He will continue to headquarter in Houston. **W. F. Brown,** special assistant to the senior vice president, has been promoted to manager of petrochemical planning, a new position. **P. E. Geiser,** general manager of petrochemical manufacturing, has been named general manager of petrochemical operations. **Dr. M. L. Sharrah** will continue as manager of the research and development department. Brown and Geiser will continue to headquarter in Houston; Sharrah will continue to headquarter in Ponca City, Okla.

GEISER

Jack C. Sandridge, sales engineer with Johnston Testers in Oklahoma City, is now regulatory engineer with the Federal Power Commission in Washington.

James Patrick Wilson, gas engineer for Texaco Inc., has been transferred to New Orleans from Harvey, La.

H. W. Haight, vice president, director, and member of the executive committee of Humble Oil & Refining Co., has been named an executive vice president. **Nelson Jones,** Humble's general counsel, has been elected a director and **Forrest M. Darrough,** associate general counsel, will succeed Jones as general counsel. Haight is former president of Creole Petroleum Corp. and former chairman of the old Carter Oil Co. With his election, Humble now has three executive vice presidents—**C. E. Reistle, Jr., William Naden,** and Haight.

J. W. Powers, petroleum engineer with Tennessee Gas & Oil Co., has been transferred to Houston from Corpus Christi, Tex.

Kenneth L. Moore, corrosion engineer in the technology section of Tidewater Oil Co.'s Delaware City, Del., refinery, has been promoted to group leader.

W. L. Durr, geologist with Continental Oil Co., has been transferred to Oklahoma City from Logansport, Ind.

Maurice Cox will manage Great Western Drilling Co.'s new Rocky Mountain regional exploration office in Denver. **David M. Evans,** Denver consulting geologist, will assist Cox.

Roy H. Guess, Newman Brothers Drilling Co., has been elected 1961 president of South Texas Geological Society. Other officers are **Porter A. Montgomery, Jr.,** Montgomery Stratigraphic Service, vice president; **Charles W. Henslee,** Shamrock Oil & Gas Corp., secretary; and **William G. Pittman,** George H. Coates, treasurer. Executive committee members are **Hubert E. Menger,** independent operator, and **John S. Rives,** George H. Coates.

L. W. Powell, British American Oil Co., Ltd., has been elected chairman of the Canadian Petroleum Association's Saskatchewan division. **D. B. Furlong,** Producer's Pipelines, Ltd., has been named vice chairman. Directors for 1961 are **W. Anderson,** Sun Oil Co.; **S. F. Bird,** Mobil Oil of Canada, Ltd.; **M. Dillman,** Orecan Oil, Ltd.; **V. H. Hunter,** Imperial Oil, Ltd.; **C. G. Kissinger,** Kissinger Petroleums, Ltd.; **W. M. Laidman,** Central-Del Rio Oils, Ltd.; **W. M. Lawson,** Anglo American Exploration, Ltd.; **C. E. Leach,** Tidewater Oil Co.; **A. M. McLachlin,** Shell Oil Co. of Canada, Ltd.; **J. A. Rupf,** South Saskatchewan Pipe Line Co.; **E. L. Semple,** Great Northern Oil Purchasing Co.; **J. A. Smith,** Woodley Canadian Oil Co.; **P. E. Trent,** Western Leaseholds, Ltd.; and **D. M. Tyerman,** MacPherson, Leslie & Tyerman.

Theodore F. Bradley, head of the plastics and resins department in Shell Development Co.'s Emeryville, Calif., research center, has retired.

Richard R. Lindsly, associate reservoir engineer for Phillips Petroleum Co. in Alvin, Tex., has been named district staff engineer in Big Spring, Tex.

R. H. Rainey, marketing manager for Geophysical Service, Inc., has been named assistant to **C. M. Moore, Jr.,** Eastern Hemisphere vice president.

James B. Taylor has been named general manager of Signal Oil & Gas Co.'s gas department. **Paul Chambers** has been transferred from Tulsa to Los Angeles as assistant to the general manager. Also, **R. L. Cook** has been named manager of operations and **Harvey Menard** has been named manager of joint interests. **David R. Arnold** is manager of engineering and construction.

Richard Brewer, partner in Reed & Brewer, Houston, and **Dr. Lawrence Y. Faust,** geophysical supervisor for Amerada Petroleum Corp., Tulsa, have been nominated for president of Society of Exploration Geophysicists. Election will be by mail ballot and officers will begin their terms in November. Other nominees are, for first vice president, **Dr. Milton B. Dobrin,** Triad Oil Co., Calgary, and **Harold J. Kidder,** Mobil Oil of Canada, Calgary; for vice president, **Dr. John S. Sumner,** Phelps-Dodge Corp., Douglas, Ariz., and **Dr. Stanley H. Ward,** University of California, Berkeley. Candidates for secretary - treasurer are **Samuel R. Marsh,** Humble Oil & Refining Co., Shreveport, La., and **R. Maxey Pinson,** Union Oil Co., Midland, Tex. **Dr. R. B. Rice,** Ohio Oil Co., Denver, and **John Bemrose,** Sinclair Research Laboratories, Tulsa, have been nominated for editor.

BREWER

FAUST

Erik Waering, assistant manager of Pan American Argentina Oil Co., has been named general manager of Trinidad operations of Pan American International Oil Corp. He will headquarter in Port au Spain. Waering had been with DeGolyer & MacNaughton, Pemex, and Helmerich & Payne, Inc., before joining Pan Am. He held assignments in Jamaica and Venezuela before his Argentine appointment.

L. E. Thomas, district engineer for Amerada Petroleum Corp., has been transferred to Houston from Longview, Tex.

C. E. (Ed) Mohler has been transferred by Jet Oil Co. from Tulsa to Mount Vernon, Ill., where he will be senior geologist.

Herbert E. Rose, research and development engineer for Superior Oil Co., has been transferred to Bakersfield, Calif., from Pasadena, Calif.

James G. McDaniel, manager of Beaumont division engineering for Socony Mobil Oil Co., has joined Tears Engineers, Inc., Dallas, as project engineer.

Ralph C. Medhurst has been named project chemist in American Oil Co.'s research and development department.

Joseph C. DuBois, geologist with Mobil Oil Co., has been transferred to Corpus Christi, Tex., from Lafayette, La.

R. A. Keans, president of Keans, Springmann & Stipek, Inc., a land and leasing firm, has been elected president of the Petroleum Club of Los Angeles. He succeeds **Earl Hightower,** attorney. Other officers are **K. W. Kendrick,** Standard Oil Co. of California, Western Operations, Inc., vice president; and **Elmer L. DeMaris** consultant, treasurer. **Richard Sneddon** was reelected secretary-treasurer.

P. D. Manning, district production superintendent for Pan American Petroleum Corp., in Shreveport, La., will be in charge of production in the company's expanded Jackson, Miss., district. Pan Am will move its Shreveport district exploration and producing office to Jackson about July 1. **R. L. Nelson,** district exploration superintendent in Jackson, will be in charge of exploration for the combined district. **Darrell E. Smith,** Shreveport, has been named district exploration superintendent in Midland, Tex. He succeeds **N. T. Brasher,** who has resigned.

▶▶▶ Personals

John A. Armstrong, general manager of the producing department of Imperial Oil Ltd., has been elected a director. He succeeds **George L. Macpherson,** who has retired. Armstrong has been with Imperial since 1940. He was assistant manager of the western producing region before being named general manager of production last year. Macpherson was general manager of manufacturing when he was elected a director of Imperial in 1954. He had been with the company since 1922.

ARMSTRONG

John B. Roden, head of Roden Drilling Co., Cheyenne, Wyo., subsidiary of Big Spring Exploration Co., has been elected president of the parent firm. He succeeds **John R. Hatch,** who has resigned.

Clyde G. Strachan, retired Gulf Oil Corp. geologist and geophysicist, has joined the University of Tulsa's information - services department. The department handles the university's new petroleum technical abstracting service (OGJ, Nov. 21, 1960).

▶▶▶ Deaths

Martin Sain, 76, founder of Redeventza Co., pioneer Romanian oil firm, and of Soc. Portuguesa de Refineria de Petroleos, Portuguese refining company, died February 2 in Esteril, Portugal.

Bradley Clyde Phair, 55, business manager of Lee Brothers Oil Co., Houston, died February 5 in Houston. He had been with Lee Brothers since 1928.

Dr. Elias Howard Sellards, 85, University of Texas geologist and anthropologist, died February 4 in an Austin, Tex., hospital. Sellards was a prominent figure in the 1921 Texas-Oklahoma boundary dispute. His geological information helped uphold Texas' boundary claims, which involved oil land worth millions.

Hallard Baxter Sherrod, 56, head of the procedure department in Pan American Petroleum Corp.'s central division, Oklahoma City, died February 7 in an Oklahoma City hospital. He had been with Pan Am 24 years.

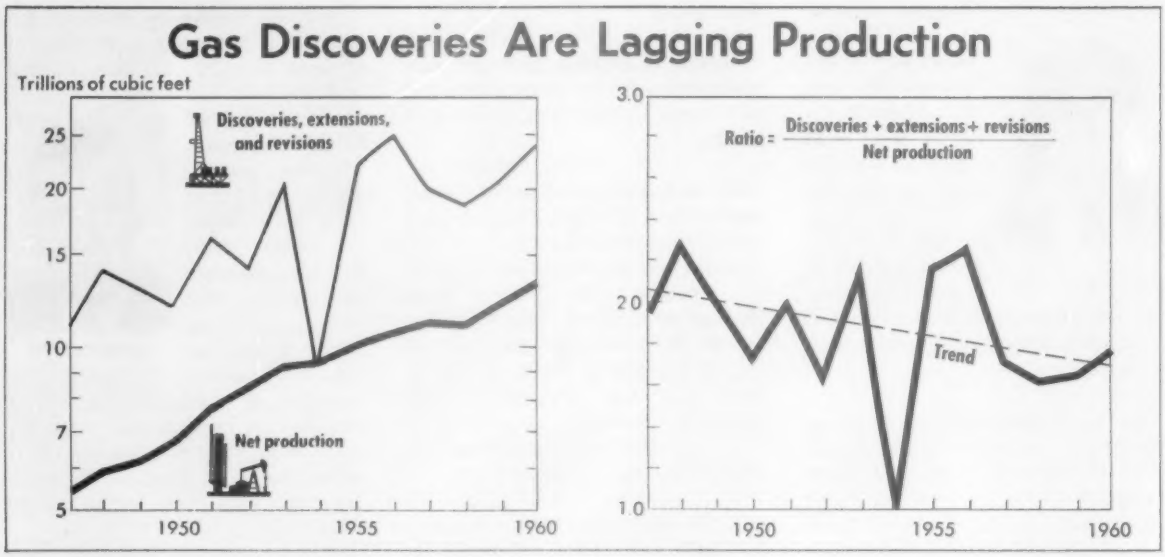
H. M. Hunt, Owensboro, Ky., independent producer, died January 31. He was 83.

Fred Maurer, 77, retired marine superintendent in charge of Mobil Oil Co.'s Terminal Island facilities, Los Angeles, died January 31, at his home in Ojai, Calif. He retired in 1945.

Karl T. Wiedemann, 74, Wichita, owner of Beaumont Petroleum Co., Beaumont, Kans., died January 29 of injuries suffered in an auto accident near Leon, Kans.

John Pierce Herrick, 93, pioneer oil producer and newspaper publisher, died recently in a Hollywood hospital. He was a founder and later president emeritus of New York State Oil Producers Association and an organizer of Pennsylvania Grade Crude Oil Association.

Ova Glenn Jackson, 65, retired head of the purchasing department at the El Dorado, Kans., refinery of American Petrofina, Inc., died January 23 at his home in El Dorado. Jackson retired in December after 33 years at the El Dorado refinery.



Gas use calls for more gas wildcats

BY JOHN C. CASPER

IF GAS PRODUCERS expect to keep up with the rapidly expanding demand for natural gas, they will have to shift an even larger portion of the exploration budget to the search for gas.

Wildcatters have been paying more attention to gas in recent years. Gas has been accounting for larger and larger percentages of successful wildcats. Exploratory drilling is shifting to gas areas. More companies are actively seeking new gas reserves.

Despite this swing in interest, the gas discovery rate is not keeping pace with marketed production.

The chart on the left compares net production of natural gas with annual discoveries and extensions plus revisions in reported reserves. The graphs are plotted on a semi-log scale. On such a scale, a straight line over a period indicates a constant percentage gain.

Basic data are from reports of the Committee on Natural Gas Reserves of the American Gas Association. Figures for 1960 are The Oil and Gas Journal estimates.

The upper line represents discoveries, extensions, and revisions. The point for a given year represents gross additions on the "receipts" side of the ledger. Despite year-to-year variations, there was a general upward trend for the period from 1947 through 1956. For the past 4 years, the chart seems to show a leveling off.

The bottom line represents net production each year. Points on the line show only one decrease, and that reduction amounted to only 0.1%. It came in 1948.

Continuing increases in production at a near-constant rate from reservoirs that are fed by declining discoveries adds up to a slowdown in gas production later in this decade.

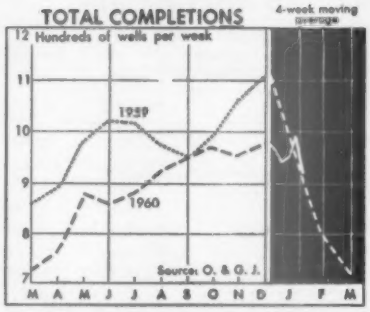
This ratio of discoveries to production is the basis for the chart on the right. Note that the trend for the 1947-60 period has a definite downward slope. Cover all of the line up to 1955. Points for the remaining years, from 1955 through 1960, show a very pronounced drop.

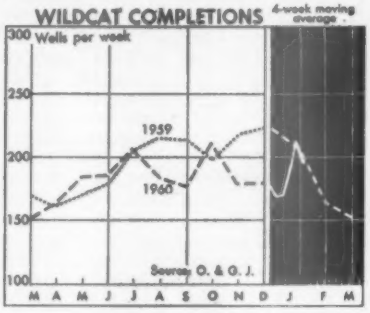
Since most contracts cover periods up to 20 years, most of the present reserve is dedicated. If sales are to increase at postwar rates, the discovery rate must improve. That means more gas wildcats.

A quick look at the highlights . . .

	LATEST WEEK	Change from WEEK AGO		Change from YEAR AGO	
Production	7,132,060	DOWN	52,715	DOWN	129,648
Crude stocks	236,104,000	DOWN	304,000	DOWN	12,673,000
Completions	726	DOWN	102	DOWN	73
Refinery runs	8,297,000	DOWN	104,000	UP	98,000
Gasoline stocks	214,349,000	UP	4,395,000	UP	7,931,000
Kerosine stocks	25,989,000	DOWN	2,386,000	UP	1,701,000
Distillate stocks	106,682,000	DOWN	8,889,000	DOWN	14,839,000
Residual stocks	43,407,000	DOWN	984,000	DOWN	4,266,000
Four-product stocks	390,427,000	DOWN	7,864,000	DOWN	9,473,000
Total imports	2,190,800	DOWN	63,000	UP	146,500

Active Rotary Rigs





	2-6-61	1-30-61	2-8-60
Alabama	7	7	4
Alaska	7	7	(*)
Arkansas	13	10	11
Arizona	1	1	0
California	68	76	59
Land	64	72	53
Offshore	4	4	6
Colorado	22	26	26
Florida	3	3	1
Land	2	3	0
Offshore	1	0	1
Illinois	32	22	17
Indiana	9	3	5
Iowa	0	0	2
Kansas	103	91	112
Kentucky	2	5	9
Louisiana	250	244	304
North	21	23	34
S. Inland waters	94	91	115
S. Land	84	78	98
Offshore	51	52	57
Michigan	22	16	34
Mississippi	36	41	72
Missouri	1	1	1
Montana	19	21	8
Nebraska	22	17	17
Nevada	1	1	0
New Mexico	92	100	89
North Dakota	11	11	22

	2-6-61	1-30-61	2-8-60
Ohio	4	4	2
Oklahoma	175	162	185
Oregon	1	1	0
Pennsylvania	6	8	11
South Dakota	0	0	2
Texas	525	550	597
S. Inland waters	5	5	7
S. Land	142	153	162
Offshore	1	2	0
North	45	46	47
Panhandle	51	54	45
East	41	46	49
West Central	†136	†145	205
West	104	99	82
Utah	25	25	26
Washington	1	2	1
West Virginia	7	4	3
Wyoming	47	46	58
Total U. S.	1,512	1,505	1,678
Western Canada	192	186	235
Eastern Canada	0	0	4
Grand total	1,704	1,691	1,917

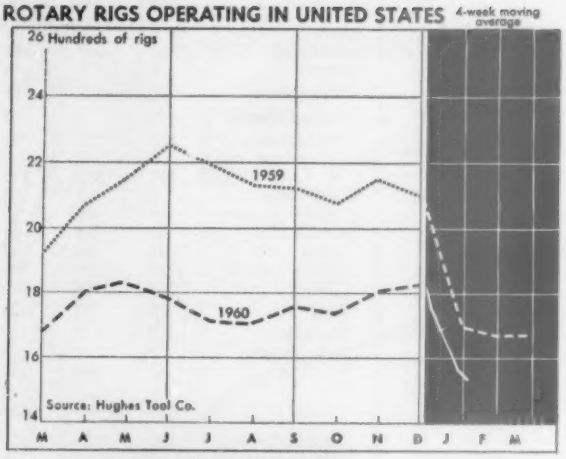
Hughes Tool Co. report. *Data first reported 4-4-60. †Stephens and Eastland counties now included in West Central.

WEEKLY WELL COMPLETIONS . . . WEEK ENDED FEBRUARY 4, 1961

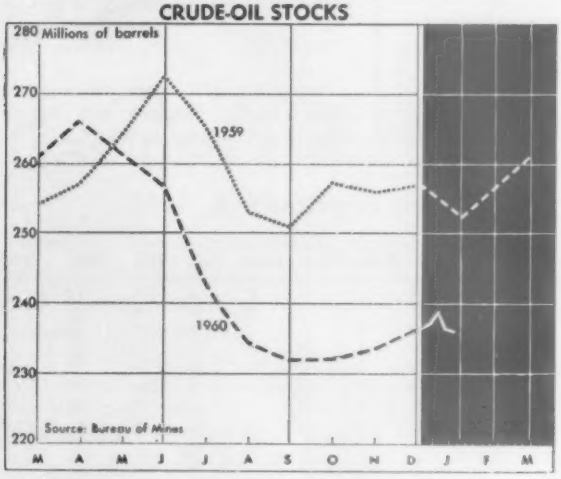
	Total wells							Cum.		Total wildcats					Cum.	
	Total	Crude	Cond.	Gas	Dry	Service	Footage	1961	1960	Total	Crude	Cond.	Gas	Dry	1961	1960
Arkansas	8	4	0	0	4	0	26,837	47	61	1	0	0	0	1	14	16
California	31	21	0	2	8	0	139,455	204	153	5	0	0	1	4	25	36
Colorado	14	1	0	6	7	0	58,405	77	83	8	1	0	2	5	46	43
Illinois	18	6	0	0	10	2	43,539	194	259	5	0	0	0	5	41	67
Indiana	7	4	0	0	3	0	10,425	84	109	0	0	0	0	0	14	36
Kansas	94	48	0	4	38	4	284,415	537	379	24	1	0	2	21	107	123
Kentucky	21	6	0	3	10	2	37,132	149	253	1	0	0	0	1	14	26
Louisiana	43	9	2	10	22	0	262,454	429	379	9	0	2	0	7	61	49
North	26	7	0	9	10	0	80,672	152	135	2	0	0	0	2	24	21
South	15	2	2	1	10	0	159,854	213	186	7	0	2	0	5	35	26
Offshore	2	0	0	0	2	0	21,928	64	58	0	0	0	0	0	2	2
Michigan	7	2	0	0	5	0	25,682	81	87	3	0	0	0	3	40	29
Mississippi	14	7	0	1	6	0	142,941	75	80	4	1	0	0	3	27	30
Montana	2	0	0	0	2	0	13,256	37	36	2	0	0	0	2	18	19
Nebraska	11	7	0	0	4	0	49,363	63	78	2	0	0	0	2	29	28
New Mexico	26	15	0	6	4	1	136,576	161	226	2	0	0	1	1	21	33
West	15	6	0	6	3	0	79,776	79	82	2	0	0	1	1	12	6
East	11	9	0	0	1	1	56,800	82	144	0	0	0	0	0	9	27
New York	28	15	0	0	2	11	37,100	115	50	0	0	0	0	0	0	5
North Dakota	7	3	0	0	4	0	45,327	25	34	2	0	0	0	2	5	6
Ohio	18	12	0	3	3	0	51,047	96	141	1	0	0	0	1	6	8
Oklahoma	102	47	0	1	25	29	138,939	463	421	0	0	0	0	0	55	84
Pennsylvania	0	0	0	0	0	0	0	50	6	0	0	0	0	0	4	2
Texas	228	121	4	4	87	12	1,010,979	1,548	1,883	46	1	0	0	45	351	380
Dist. 1	5	2	0	0	3	0	15,021	82	134	2	0	0	0	2	32	48
Dist. 2	5	2	0	0	3	0	44,873	88	80	1	0	0	0	1	15	20
Dist. 3	18	7	1	0	10	0	137,699	128	168	4	0	0	0	4	33	32
Dist. 4	15	4	1	2	5	3	80,851	164	174	4	0	0	0	4	44	47
East	15	8	1	0	6	0	83,104	126	162	5	0	0	0	5	33	36
Dist. 7-B	45	19	0	0	26	0	146,480	214	234	17	0	0	0	17	66	68
West	60	35	1	1	16	7	330,681	353	522	12	1	0	0	11	78	67
Dist. 9	50	31	0	0	17	2	112,389	252	310	0	0	0	0	0	38	55
Dist. 10	15	13	0	1	1	0	59,881	141	99	1	0	0	0	1	12	7
Utah	2	2	0	0	0	0	12,613	18	31	1	1	0	0	0	14	13
West Virginia	16	1	0	12	3	0	39,449	99	62	0	0	0	0	0	0	1
Wyoming	26	8	0	1	15	2	125,974	115	107	14	0	0	1	13	50	47
Misc., Alaska, Wash., Mo.	3	1	0	0	2	0	14,849	45	29	2	0	0	0	2	38	19
Total U. S.	726	340	6	53	264	63	2,706,757	4,712	4,947	132	5	2	7	118	980	1,100
Previous week	828	361	16	75	331	45	3,240,146			172	21	2	4	145		
Cum. 1961	4,712	2,116	151	411	1,765	269	19,564,983			980	74	18	33	855		
Cum. 1960	4,947	2,329	179	409	1,896	134	21,585,009			1,100	97	13	34	956		
Western Canada	64	37	0	9	17	1	334,543	249	207	18	2	0	2	14	67	57

PRODUCTION

ROTARY RIGS OPERATING IN UNITED STATES



CRUDE-OIL STOCKS



CRUDE-OIL STOCKS BY STATES OF ORIGIN*
(Thousands of barrels)

	1-28-61	1-21-61	1-30-60
Pennsylvania	2,100	2,145	2,250
Other Appalachian	1,272	1,290	1,956
Illinois, Indiana, Michigan	8,535	8,177	9,603
Nebraska and North Dakota	2,715	2,786	2,801
Kansas	9,103	9,315	9,131
Oklahoma	15,522	15,580	16,789
Arkansas	1,772	1,606	2,183
Louisiana	17,638	19,109	18,831
North	3,150	3,190	3,226
South	14,488	15,919	15,605
Mississippi, Alabama, Florida	1,994	2,013	2,487
New Mexico	7,371	7,473	7,392
Texas	100,402	99,918	106,501
East Texas	8,291	8,421	7,964
West Texas	45,063	45,859	50,068
Texas Gulf	18,380	17,575	19,026
Other Texas	28,668	28,063	29,443
Wyoming	17,042	17,332	17,365
Other Rocky Mountain	10,469	9,594	9,128
California	25,139	25,220	28,246
Foreign	†15,030	14,850	14,114
Total	**236,104**	236,408	248,777

*Bureau of Mines. †Includes 5,038,000 bbl. in California.

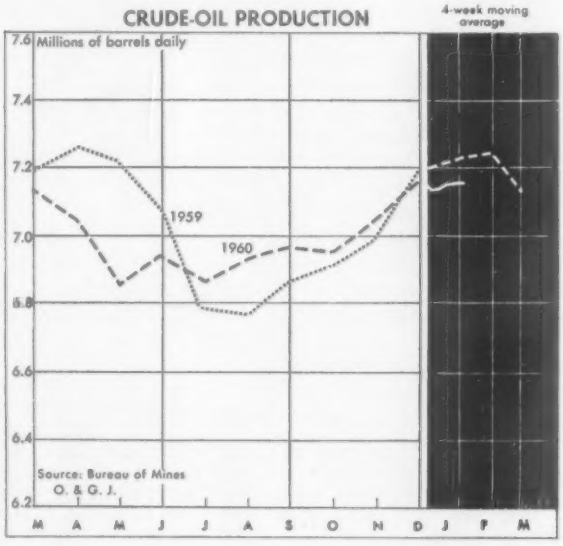
DAILY AVERAGE PRODUCTION FOR WEEK

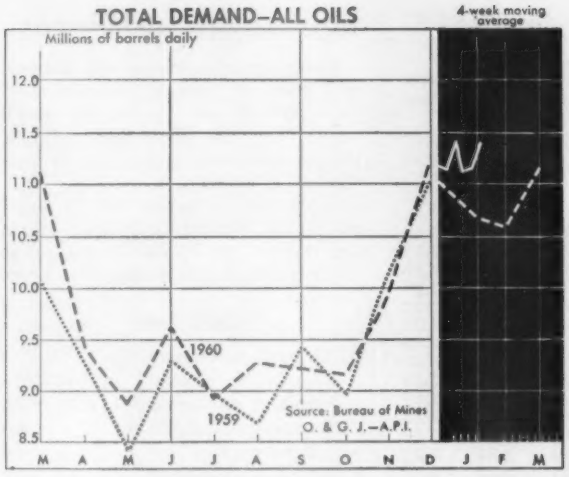
	February 4, 1961 Crude oil	Lease condensate	Total	Jan. 28 total
Alabama	21,425	.....	21,425	21,350
Alaska	6,600	.....	6,600	6,400
Arkansas	77,975	150	78,125	78,025
California	828,000	.....	828,000	830,600
Colorado	131,400	.....	131,400	131,800
Eastern	37,800	.....	37,800	39,500
Florida	1,000	.....	1,000	1,000
Illinois	213,100	.....	213,100	209,900
Indiana	33,000	.....	33,000	33,400
Kansas	†280,035	.....	†280,035	†310,875
Kentucky	57,100	.....	57,100	56,700
Louisiana	986,550	147,450	1,134,000	1,122,175
North	105,550	6,200	111,750	111,675
South	881,000	141,250	1,022,250	1,010,500
Michigan	48,800	.....	48,800	48,600
Mississippi	146,575	4,250	150,825	150,950
Montana	81,600	.....	81,600	81,100
Nebraska	65,100	.....	65,100	68,250
Nevada	50	.....	50	50
New Mexico	287,800	8,500	296,300	293,200
North Dakota	66,600	.....	66,600	66,800
Oklahoma	†498,000	.....	†498,000	†527,900
Texas	2,506,850	100,350	2,607,200	2,609,850
Dist. 1	42,000	3,700	45,700	45,700
Dist. 2	105,150	8,400	113,550	114,600
Dist. 3	319,275	41,000	360,275	360,000
Dist. 4	178,150	15,000	193,150	194,000
Dist. 5	27,000	500	27,500	27,500
Dist. 6	112,425	8,500	120,925	122,000
East Texas Field	132,575	.....	132,575	133,000
Dist. 7-B	127,425	400	127,825	127,400
Dist. 7-C	114,150	4,050	118,200	118,550
Dist. 8	1,056,425	13,000	1,069,425	1,068,000
Dist. 9	191,275	3,800	195,075	195,500
Dist. 10	101,000	2,000	103,000	103,600
Utah	110,300	.....	110,300	112,800
Wyoming	385,000	.....	385,000	382,950
Others	‡700	.....	‡700	‡600
Total U. S.	6,871,360	260,700	**7,132,060**	7,184,775
Change from prev. week, down	.....	.....	**52,715**	.....
Canada	†560,000	.....	†560,000	†598,300

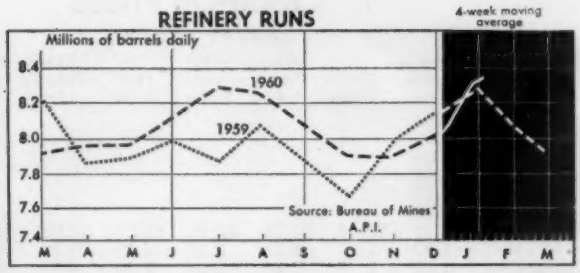
Total U. S. Prod.—Jan. 1-Feb. 4 ..... 250,622,000 bbl.
Same period last year (crude plus cond.) ..... *253,127,000 bbl.

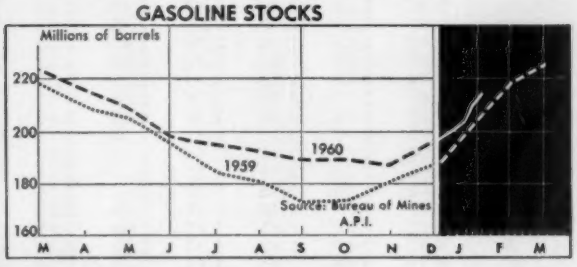
*Includes 7,694,100 bbl. condensate. †Week ended previous Monday. ‡South Dakota and Arizona.

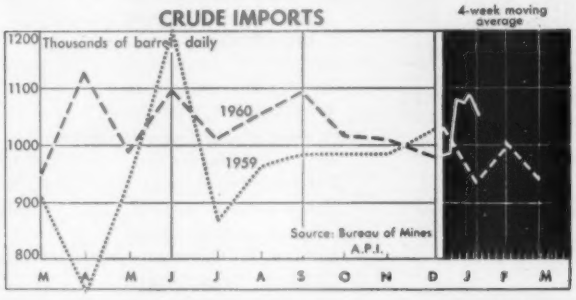
CRUDE-OIL PRODUCTION

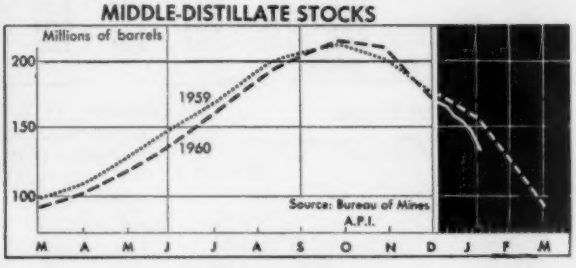


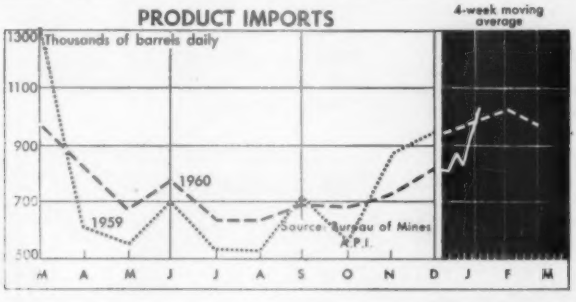


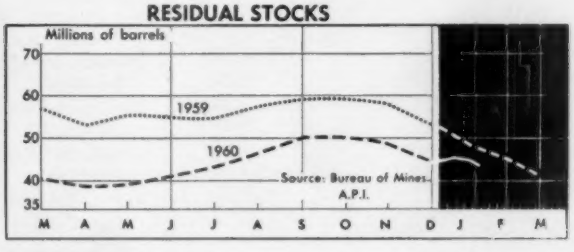












API REFINERY REPORT—FEBRUARY 3, 1961

(Thousands of barrels)

District—	Daily avg. runs	Daily average production—Gaso.*	Kero.	Dist.	Resid.	Stocks‡—Gaso.†	Kero.	Dist.	Resid.	Bureau of Mines, February 1960—Daily avg. runs	Daily average production—Gaso.*	Kero.	Dist.	Resid.
East Coast	1,176	493.6	40.9	407.3	146.7	46,429	10,195	35,435	12,498	1,117	538.3	33.8	321.0	173.1
Appalachian:														
District 1	91	35.0	3.7	23.6	13.3	5,782	671	2,907	579	98	40.9	3.7	21.1	14.9
District 2	94	49.7	7.8	15.4	13.7	3,156	345	1,216	346	106	54.8	7.4	18.3	15.4
Ind., Ill., Ky.	1,489	733.7	68.6	367.3	193.4	36,870	4,797	18,277	5,485	1,489	769.2	68.5	314.0	206.7
Minn., Wis., Dak.	132	62.3	8.1	26.4	21.9	6,939	880	5,150	598	117	54.2	4.9	26.8	19.0
Okla., Kans., Mo.	743	405.0	19.3	189.7	30.6	19,252	1,143	10,510	798	741	410.2	15.1	186.6	31.3
Inland Texas	291	204.8	15.8	41.7	16.6	7,626	423	1,361	2,470	292	205.3	10.1	44.4	22.6
Texas Gulf Coast	1,968	969.6	168.0	556.9	163.6	32,583	3,006	9,483	5,728	1,902	956.2	120.4	453.1	140.4
La. Gulf Coast	733	365.0	45.0	230.6	64.8	11,612	1,846	3,869	1,258	663	333.0	63.1	130.3	50.0
N. La. and Ark.	109	64.4	4.6	21.9	7.0	6,314	690	2,599	136	109	66.7	7.6	22.3	6.9
Rocky Mountain:														
New Mexico	25	12.4	1.0	5.6	4.0	858	49	113	40	25	13.1	0.4	4.0	2.3
Other	281	144.6	5.3	66.7	34.9	7,087	386	2,252	1,019	302	141.4	4.4	70.4	35.3
West Coast	1,165	553.0	39.0	196.0	315.1	29,841	1,558	13,510	12,452	1,104	535.8	19.5	176.6	280.0
Feb. 3, 1961	8,297	4,093.1	427.1	2,149.0	1,025.6	214,349	25,989	106,682	43,407	8,065	4,119.1	358.9	1,788.9	997.9
Jan. 27, 1961	8,401	4,211.4	444.7	2,143.0	953.7	209,854	28,375	115,571	44,391	.....	.....	.....	.....	.....
Feb. 5, 1960	8,199	4,150.0	338.3	1,956.6	1,090.6	206,418	24,288	121,521	47,673	.....	.....	.....	.....	.....

*At refineries including natural blended. †Finished and unfinished. ‡At refineries, bulk terminals, in transit, and in pipelines.

Crude-Oil Prices

GRAVITY SCHEDULE

	Signal Hill, Calif.	Oklahoma	West Tex. (sour)	West Tex. (Inter.)	No.* Texas	Texas Refugio Light	Bayou Sale (La.)	Denver Julesburg	Wyo. (sour)
14-14.9	$1.86	....	....	....	....	....	....	....	....
15-15.9	1.93	....	....	....	....	....	....	....	1.81
16-16.9	2.00	....	....	....	....	....	....	....	1.86
17-17.9	2.06	....	....	....	....	....	....	....	1.96
18-18.9	2.13	....	....	....	....	....	....	....	1.96
19-19.9	2.20	....	....	....	....	....	....	....	2.01
20-20.9	2.27	$2.49	$2.35	$2.61	$2.29	$2.95	$2.90	$2.58	2.06
21-21.9	2.33	2.52	2.38	2.63	2.33	2.97	2.92	2.60	2.11
22-22.9	2.40	2.55	2.41	2.65	2.37	2.99	2.94	2.62	2.16
23-23.9	2.46	2.58	2.44	2.67	2.41	3.01	2.96	2.64	2.21
24-24.9	2.53	2.61	2.47	2.69	2.45	3.03	2.98	2.66	2.26
25-25.9	2.60	2.64	2.50	2.71	2.49	3.05	3.00	2.68	2.31
26-26.9	2.67	2.67	2.53	2.73	2.53	3.07	3.02	2.70	2.36
27-27.9	2.74	2.70	2.56	2.75	2.57	3.09	3.04	2.72	2.49
28-28.9	2.81	2.73	2.59	2.77	2.61	3.11	3.06	2.74	2.54
29-29.9	2.87	2.76	2.62	2.79	2.65	3.13	3.08	2.76	2.59
30-30.9	2.93	2.79	2.65	2.81	2.69	3.15	3.10	2.78	2.63
31-31.9	3.00	2.82	2.68	2.83	2.73	3.17	3.12	2.80	2.67
32-32.9	3.06	2.85	2.71	2.85	2.77	3.19	3.14	2.82	2.71
33-33.9	3.12	2.88	2.74	2.87	2.81	3.21	3.16	2.84	2.75
34-34.9	3.17	2.91	2.77	2.89	2.85	3.23	3.18	2.86	2.79
35-35.9	3.22	2.94	2.80	2.91	2.89	3.25	3.20	2.88	2.83
36-36.9	3.27	2.97	2.83	2.93	2.93	3.27	3.22	2.90	2.87
37-37.9	3.31	2.99	2.86	2.95	2.95	3.29	3.24	2.92	2.89
38-38.9	....	3.01	2.89	2.97	2.97	3.31	3.26	2.94	2.91
39-39.9	....	3.03	2.92	2.99	2.99	3.33	3.28	2.96	2.93
40-44.9	....	3.05	2.95	3.01	3.01	3.35	3.30	2.98	2.95

*Cooke, Grayson, Montague.

Flat Prices

Louisiana:
- Sweet Lake $3.00

Texas:
- East Texas 3.05-3.25
- Conroe 3.23-3.53
- Van 3.08

Pennsylvania Grade:
- Bradford $4.75-4.80
- Middle District 4.52
- Southwest Pennsylvania 4.25
- West Virginia 4.17
- Buckeye Grade 4.08

Illinois Basin 3.00-3.05

Foreign

Middle East, Persian Gulf: (cargoes f.o.b. lifting port)
- Arabian, 34.0°-34.9°, Ras Tanura $1.80
- Iranian, 34.0°-34.9°, Bandar Mashur 1.78
- Iranian, 34.0°-34.9°, Abadan 1.73
- Iraq, 35.0°-35.9°, Fao 1.72
- Kuwait, 31.0°-31.9°, Mina-al-Ahmadi 1.59
- Qatar, 41.0°-41.9°, Umm Said 1.95

Middle East, E. Mediterranean:
- Arabian, 34.0°-34.9°, Sidon $2.17
- Iraq, Mosul-Kirkuk, 35.0°-35.9°, Tripoli 2.19

Far East (cargoes, f.o.b. Lutong, Sarawak):
- Seria Light, 36° 2.42

Canada:
- Leduc-Woodbend $2.53
- Redwater (Alta.) 2.42
- Weyburn (light) 2.06
- Midale C 1.70

Venezuela:
- Cumbarebo, 47°-47.9°, Tucupido 3.34
- San Joaquin, 40°-40.9°, Puerto La Cruz 3.08
- Oficina, 35°-35.9°, Puerto La Cruz 2.80
- Tia Juana medium, 26°-26.9°, Amuay* 2.30
- Quiriquire, 16.0-16.4°, Caripito 2.10
- Lagunillas heavy, flat, Las Piedras* 2.10
- Bachaquero, flat, 15°-16°, Las Piedras* 1.88

Prices for all crudes of 24° or lighter vary 2 cents per degree change, up or down. All crudes heavier than 24° vary 2.5 cents per half-degree gravity change.

*Also available at La Salina at 3 cents per barrel less.

Tanker Rates (Long Ton)

(Latest reported spot fixtures)

- ★ Gulf-NY, clean (ATRS + 55%) $4.42
- ★ Gulf-NY, dirty (ATRS + 25%) 3.56
- ★ Carib.-NY, dirty (ATRS — 55%) 1.24
- PG-UK, dirty (Scale — 52.5%) (29s. 0d.) 4.06
- ★ Carib.-UK, dirty (Scale — 60%) (13s. 0d.) 1.82

★Denotes change from previous week.

Refined-Product Prices

Following quotations are realistic spot prices for refined products moving interstate on Wednesday each week. They may differ from refiners' posted prices and should not be considered as postings.

Light-product prices are in cents per gallon. Residual and crude prices are dollars per barrel. Crude prices are at the well unless otherwise listed.

Gasoline*

Mid-Continent (Group 3):
- Regular (91 octane) .. 12.00-12.50
- Premium (99 octane) . 14.75-15.25
- Natural gasoline (26-70) 4.5
- Breckenridge 4.0

Gulf Coast (cargoes for coastwise or export movements):
- Regular (90 octane) .. 11.00
- Regular (92 octane) .. 11.25
- Premium (98 octane) . 12.25

California (rack) Los Angeles:
- Regular (90 octane) .. 11.30
- Premium (95 octane) .. 12.30
- Premium (100 octane) . 13.80

Caribbean area (cargoes):
- Regular (87 octane) .. 10.125-10.25
- Premium (97 octane) . 11.75

*Quotations are for octanes shown. Prices usually vary with octane ratings within the regular, premium, and aviation grades.

Kerosine and Distillate

Mid-Continent (Group 3):
- Kerosine 42-44 .... 10.875
- Diesel oil (58 d.i. and above) 10.50
- Distillate No. 1 ... 10.50
- Distillate No. 2 .... 9.50

Gulf Coast (cargoes):
- ★ Kerosine 41-43 ..... 10.25
- ★ Distillate No. 2 ..... 9.50

New York Harbor (barges):
- ★ Kerosine 42-43 ..... 11.90
- ★ Distillate No. 2 ..... 10.90
- ★ Diesel fuel, 48-52 d.i. 11.05

Caribbean area (cargoes):
- ★ Distillate No. 2 ..... 8.625-8.875

Residual Fuel (Bbl.)

Mid-Continent (Group 3):
- Residual fuel (max 1% S) .. $1.90

Gulf Coast (cargoes):
- Bunker C fuel 2.30

New York Harbor (barges):
- Bunker C fuel 2.52

Caribbean (cargoes):
- Bunker C 2.10

California (rack):
- Bunker C fuel, Los Angeles 2.25

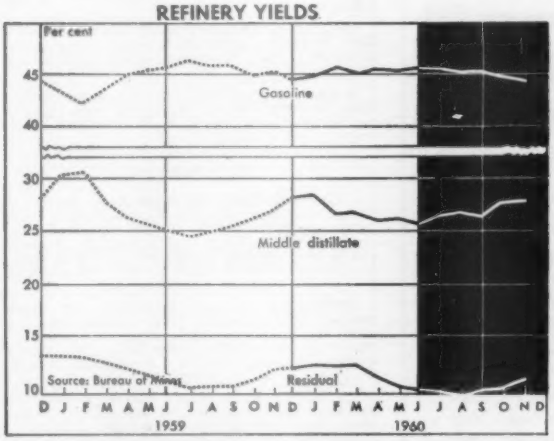
SUPPLY AND DEMAND—MAJOR PRODUCTS

(Thousands of barrels daily)

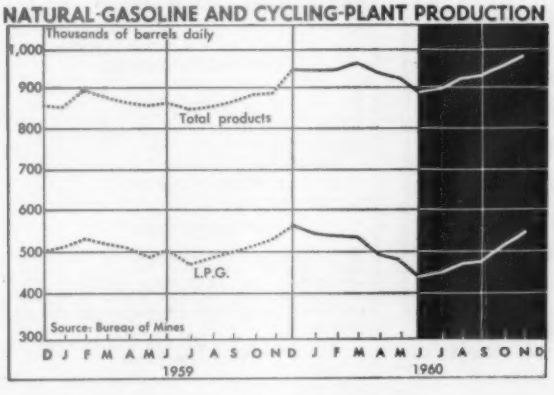
	Total demand	Refinery production	Stocks end of period†
GASOLINE			
January 1961*	3,740	4,160	213,500
December 1960*	4,000	4,170	196,000
November 1960	4,187	4,129	188,726
February 1960	3,786	4,149	217,139
January 1960	3,654	4,238	205,982
KEROSINE			
January 1961*	620	450	27,700
December 1960*	590	427	31,900
November 1960	426	413	36,722
February 1960	483	359	23,020
January 1960	479	437	26,510
DISTILLATE			
January 1961*	3,155	2,085	109,200
December 1960*	2,985	1,890	141,100
November 1960	2,070	1,829	173,913
February 1960	2,553	1,789	105,015
January 1960	2,806	1,931	125,924
RESIDUAL			
January 1961*	1,890	950	43,700
December 1960*	1,780	944	46,200
November 1960	1,660	904	49,525
February 1960	1,982	998	45,775
January 1960	2,042	1,047	49,306

*Preliminary. †Thousands of barrels.

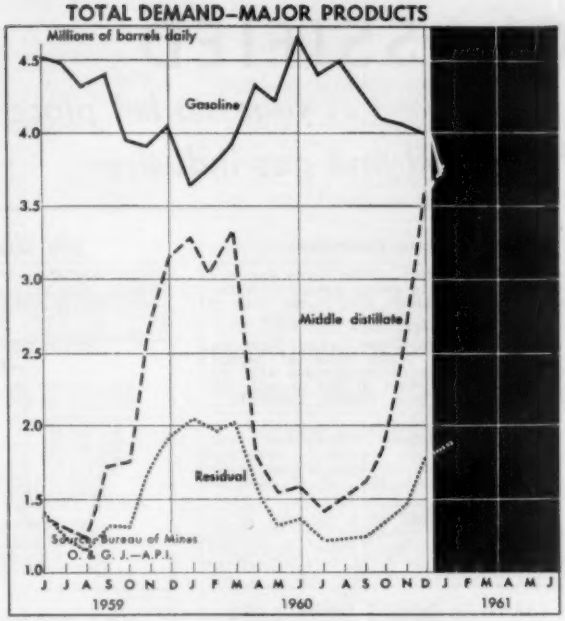
REFINERY YIELDS



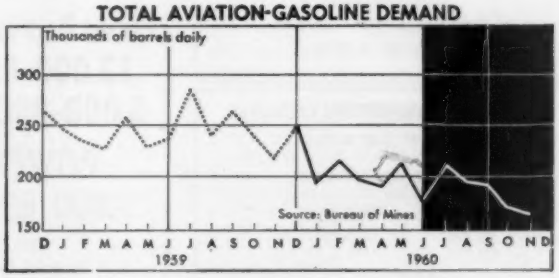
NATURAL-GASOLINE AND CYCLING-PLANT PRODUCTION



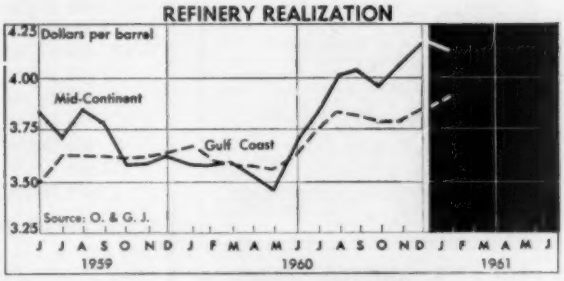
TOTAL DEMAND–MAJOR PRODUCTS



TOTAL AVIATION-GASOLINE DEMAND



REFINERY REALIZATION



REFINERY REALIZATION

	Jan.*	Dec.*	Nov.	Oct.
Mid-Continent	$4.12	$4.16	$4.06	$3.97
Gulf Coast	3.90	3.85	3.81	3.83

*Preliminary. Refinery realization is based on yields of major products and average spot prices of regular gasoline, kerosine, No. 2 fuel, and residual as published in The Oil and Gas Journal.

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8—K.V.G. 7¾" x 14", 100 W.P.
4—L.V.G. 5¼" x 15", 3000 W.P.
1—Worthington 10" x 11", 100 W.P.
1—Worthington 10" x 9", 125 W.P.
1—Gardner-Denver Vertical Air Compressor 2" x 5½", 1500 W.P.
1—Gardner-Denver Unit Belt Driven 7¼" x 13", 500 W.P. 14" x 13", 175 W.P. Powered by L-3000 Leroi
1—Worthington Unit Belt Driven 4⅞" x 11", 1000 W.P. Powered by W.A.K. Waukesha
1—M.A. Clark Unit Skid-Mounted 4—10½" x 8" Headers, Scrubber and building
1—Worthington Unit Belt-Driven 8⅝" x 13", 300 W.P. 4½" x 13", 1100 W.P. Inner Cooler Powered by 6G-510 Superior
1—Chicago-Pneumatic Unit Belt-Driven 14" x 13", 60 W.P. After Cooler Powered by 145 G.K.U. Waukesha
1—X.O.R. Unit 5½" x 6" x 10"

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LOCATED HOUSTON, TEXAS
(from Amoco Refinery Co., Destrehan, La.)

HEAT EXCHANGERS
50 to 4,000 sq. ft.
VESSELS—TOWERS
12" to 8' dia.
PETROCHEM FURNACES
½MM, 2½MM, 5MM BTU
PUMPS
50 to 7,000 GPM

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FOR SALE EQUIPMENT

FOR SALE gas compressors: GBU-75 Oilwell, DGE-125 Oilwell, XVG-4 Ingersoll-Rand, XVG-6 Ingersoll-Rand, RA-4 Clark. Alfred B. Kern, 305 Kennedy Building, Tulsa, Oklahoma.

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2,000,000 ft.	2"	3.50# to the ft.
1,000,000 ft.	3"	7.70#
1,000,000 ft.	4"	10.98#
500,000 ft.	6"	19.80#
200,000 ft.	8 5/8"	28#
400,000 ft.	10¾"	35#
75,000 ft.	12¾"	40#
50,000 ft.	18"	59#

All No. 1 Grade Plain end and cleaned.

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Columbus 19, Ohio
Phone CL 3-5527

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Fixed Bed HYDROFINERS
12,000 BSD Naphtha
5,000 BSD Heating Oil
POWERFORMER
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30.7 MM BTU/hr.	CHROME	Tubes
19.3 MM BTU/hr.	CHROME	Tubes
17 MM BTU/hr.	CHROME	Tubes
9.7 MM BTU/hr.	CHROME	Tubes
9 MM BTU/hr.	Carbon	Tubes
7.5 MM BTU/hr.	CHROME	Tubes (2)
5 MM BTU/hr.	Carbon	Tubes
2.5 MM BTU/hr.	Carbon	Tubes
2 MM BTU/hr.	Carbon	Tubes

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7,500 CFM @ 14.4 PSIG SUCTION 42.5 PSIG

Disch. Multi-Stage 8025 RPM driven by 1250 HP Synchronous Motor 3/60/2300/1200 RPM, 5 KW Direct Conn. Exciter, Falk Speed Increaser 6.70:1 Ratio, Precooler, Intercooler, and Aftercooler.

Send Us Your Requirements

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310 Thompson Bldg., Tulsa 3, Okla.
Box 5203, Baltimore 24, Maryland

FOR SALE EQUIPMENT

1500 FAILING long mast, kelly, propane power. Complete, core barrels, drill collars. Fred Butler, Box 481, Pueblo, Colo.

FOR SALE: 36' x 12' x 191' bolted steel compressor building and one 1500 bbl. (25' x 18') open top water tank. Located in East Texas. RAF Natural Gas Corp., 1209 Beck Building. Shreveport, La.

OILFIELD TANDEM Truck for sale. 1955 Super White, twenty-ton- complete with double winch. Gasoline. In excellent condition. Call, Wire or Write: Mack Worthington, 4504 Harrisburg, Houston, Texas. WA 1-4128.

CLARK MA-4 Gas Compressor, 150 HP, skid-mounted with radiator and accessories; 2 I.R. XVG6 Gas Compressors; 225 HP Worthington LT6 Compressor; Pumps; Exchangers; Vessels. Brill Equipment Company, 4101 San Jacinto St., Houston 4, Texas.

THREE CARDWELL R.L. Double drum Spudders completely equipped in good condition, for sale reasonable or trade for production or oilwell equipment. Box M-251, The Oil and Gas Journal, Tulsa, Oklahoma.

EQUIPMENT WANTED

WANTED—"Drive In" drilling and servicing Rig— Drill to 4,000'—Service to 10,000'. Box M-277, The Oil and Gas Journal, Tulsa, Oklahoma.

DRILLING RIGS Failing 2500, Mayhew 2000, Mayhew 1000. Petroleum Geophysical Company, 2011 Glenarm Place, Denver 5, Colorado.

WANTED: Used Failing, Joy or Sullivan—1500' to 2000'. Send complete description, prices, and locations to J. W. MenHall Drilling Co., Benton, Illinois.

HELP WANTED

CHIEF GEOLOGIST for the State of Texas. Independent Houston producing company wants Senior Geologist for Texas, including the Gulf Coast. Preferably 15 years experience, sound educational background. Location, Houston. Box M-253, The Oil and Gas Journal, Tulsa, Oklahoma.

REFINERY process engineer for independent corporation. Cost estimating, design and drafting experience. Submit resume of experience, education and salary expected. Box M-245, The Oil and Gas Journal, Tulsa, Oklahoma.

CHEMIST WITH B.S. degree to work on refined wax products and emulsions. Petroleum wax laboratory. Experience required. Please submit resumé of experience and salary expected. Box M-244, The Oil and Gas Journal, Tulsa, Oklahoma.

CHEMICAL OR PETROLEUM ENGINEER WANTED

Not over thirty-five, heavy experience in Natural Gasoline Plant Design and Operation. Submit resume of experience and education. State salary expected. Inquiries kept Confidential.

Box M-284, The Oil and Gas Journal Tulsa, Oklahoma

WANTED

Refinery Superintendent, Chief Chemist, and Process Engineer with 3-5 years experience in Catalytic cracking, HF Alkylation, and Asphalt. Send complete resume of experience and salary range desire.

Box M-254, The Oil and Gas Journal Tulsa, Oklahoma

HELP WANTED

West Coast Engineering Company has a senior position for a qualified Process Design Engineer, proficient in electronic computer programming and application. Send complete resume to: Box M-272, The Oil and Gas Journal, Tulsa, Oklahoma.

MANAGER—NATURAL GAS SALES

Medium-size fully integrated oil company needs an experienced professional engineer with ten or more years in the natural gas industry. This man must have the ability to initiate gas purchase contracts and negotiate for the sale of natural gas after determining the feasibility of such sales through economic studies. Familiarity with the southwestern and Rocky Mountain areas of the United States is a necessity. Submit a complete resume, including recent photograph, references, and salary requirements to: Box M-263, The Oil aand Gas Journal. All replies are strictly confidential and our employees know of this advertisement.

PROCESS ENGINEERS

B.S., M.S., Ph.D degrees in Chemical Engineering for process design and economic evaluation of refineries and petrochemical plants. Salary commensurate with qualifications and experience. Send complete resume of educational background, salary required, work experience, and personal history, including a copy of college transcript to:

Personnel Relations Department

CONTINENTAL OIL COMPANY

Ponca City, Oklahoma

PROCESS DESIGN ENGINEER

Outstanding opportunity with Independent Oil Company on West Coast for graduate Chemical Engineer with at least 5 years experience in petroleum refining and petro chemical plants. Qualifications emphasize new project planning and design with background in operations, design and technical services.

Inquiries held confidential.

Forward resume to
Box M-271
The Oil and Gas Journal
Tulsa, Oklahoma

HELP WANTED

OIL JOB DIRECTORY, foreign and domestic, showing where to apply for jobs. $5.00 cash OIML Co., Box 2603, Tulsa, Oklahoma

PIPELINE ENGINEER: General duties in engineering and operating department of crude oil pipeline. Minimum 3-5 years experience. Fine opportunity. Box M-265, The Oil and Gas Journal, Tulsa, Oklahoma.

PETROLEUM ENGINEER

Aggressive, independent company wants engineer with 3 to 5 years combination field and supervisory experience. Waterflood evaluation, development, and operation experience helpful. Permanent Tulsa base, some travel.

Box M-258, The Oil and Gas Journal
Tulsa, Oklahoma

OUTSTANDING OPPORTUNITY

Production Engineer

Age 35-45 with five years production experience to supervise development activities of independent Rocky Mtn. area. Gas pipeline experience desirable. Reply in confidence with complete resume and compensation requirements to

Box M-260
The Oil and Gas Journal
Tulsa 1, Oklahoma

WORLD-WIDE OPPORTUNITIES FOR Outstanding Pipe Line ENGINEERS

As a result of continued growth on an international scale, PIPE LINE TECHNOLOGISTS, INC. and affiliated companies will continue to have job opportunities for experienced Pipe Line Engineers.

We have opening at both intermediate and advanced levels in both the United States and foreign locations. Normally, the initial assignment of new staff members is in our Houston headquarters with the possibility of recurring short or long term assignments in other parts of the United States and foreign countries.

Resumes, which will be kept strictly confidential, are invited from graduate engineers with experience in responsible capacities in hydraulic and mechanical design of pipe lines and pipe line facilities, including pump stations, compressor stations and terminals. Experience in estimating and economic studies also desirable. Openings also are expected for experienced construction engineers capable of being assigned as Project Engineers.

These are unusual opportunities for well-qualified men who want to work in an atmosphere where the individual can have an important impact on the overall picture by the competent handling of challenging and out-of-the-ordinary job assignments.

Salaries commensurate with training and work experience. Liberal, well-balanced employee benefit plans.

Please include in resume full particulars regarding education, experience and salary requirements. Arrangements will be made for individual interview with interested and qualified persons.

Pipe Line Technologists, Inc.
3431 West Alabama P. O. Box 22148
Houston 27, Texas

HELP WANTED

DRILLING and completion Engineer—graduate engineer 4-8 years experience by expanding independent. Will be responsible for field supervision of drilling operations. Complete experience resume required, Box 746, Tyler, Texas.

Midwest refinery has immediate opening in computer section for a chemical engineer with several years experience in process engineering, preferably with some economics and computer experience. Our employees are aware of this ad.

Send resume of education, experience and salary requirements to:

Box M-283
The Oil and Gas Journal
211 South Cheyenne
Tulsa, Oklahoma

GEOPHYSICIST

Aggressive, medium sized, integrated oil company desires geophysicist for foreign assignment. English language sufficient. Must have minimum ten years experience including supervisory and interpretation experience in Mid-Continent, Rocky Mountain, West Texas, or Canada. Must be able to integrate geological and geophysical data. Submit complete personal and technical resume to:

Box M-285

The Oil and Gas Journal
Tulsa, Oklahoma

All replies held confidential.

Our employees know of this advertisement.

CRUDE OIL REPRESENTATIVE

Excellent opportunity for graduate Geologist or Petroleum Engineer with 5 years experience to represent progressive independent company in North Dakota.

Must be capable of dealing with producers and handling technical problems.

Salary commensurate with background and experience, plus company car and excellent fringe benefits. Married man, age 28-40.

All replies confidential.

Box M-266, The Oil and Gas Journal
Tulsa, Oklahoma

POSITIONS OPEN

PROCESS ENGINEER

Chemical Engineering degree required with a minimum of three years refinery experience including the operations of Fluid Catalytic Cracking Units and H.F. Alkylation Units.

MECHANICAL ENGINEER

A Mechanical Engineering degree required with a minimum of two years refinery maintenance experience in at least a foreman capacity.

FIRE MARSHAL and SAFETY INSPECTOR

Applicants should have experience as Fire Marshall and/or plant safety inspector in a refinery, chemical plant or a related industry.

These positions have been created as a result of a modernization program in a 15,000 bpd refinery. Employee benefits in effect are retirement plan, thrift plan, vacation, hospitalization and group insurance.

If interested in any of these positions send complete resume including references and salary range desired. All replies will be acknowledged and remain confidential. Mail to:

PERSONNEL DIRECTOR
MURPHY CORPORATION
Superior Refinery • Superior, Wisconsin

SITUATIONS WANTED

GEOLOGIST-PALEONTOLOGIST, B.S. 32, family, 8 years experience, subsurface, micropaleontology, administration in West Texas. Position desired; domestic, foreign, willing to work. Box M-255, The Oil and Gas Journal, Tulsa, Oklahoma.

MANAGER OF INDEPENDENT drilling and producing company, Appalachian Area, seeks position with independent or company, graduate Petroleum Engineer, 37, experienced in Appalachian and Southwest Areas, all phases of drilling and production. Excellent references: Box M-270, The Oil and Gas Journal, Tulsa, Oklahoma.

CHIEF ENGINEER-GENERAL Manager; Drilling and/or Production Company. Graduate engineer, 14 years petroleum engineering and management experience domestic and two successful foreign contracts; 45; married, no children. James D. Nunan, 1601 Airline Park Blvd., (Metairie), New Orleans, Louisiana. VErnon 5-6667.

PETROLEUM ENGINEER—thirteen years experience, Canadian, residing Calgary. Department head. Desires contact with producing, manufacturing or service companies planning to enter Canada. Box M-281, The Oil and Gas Journal, Tulsa, Oklahoma.

CHEMICAL ENGINEER, 34, Registered, 12 years experience in process design, operation and project engineering on gas processing plants with major and independent. Desires change to position with challenge and opportunity. Box M-275, The Oil and Gas Journal, Tulsa, Oklahoma.

PETROLEUM ENGINEER, 33, 11 years drilling, production, and engineering experience on Gulf Coast. Desires job with aggressive independent. Box M-284, The Oil and Gas Journal, Tulsa, Oklahoma.

35 YEARS EXPERIENCE

in management, land and leasing, promotions, deals, production of oil and gas. Secondary recovery. Exploration and drilling. Geological engineering degree. Age 55. Excellent health. Married. Domestic and foreign.

P. O. BOX 1311, TULSA, OKLAHOMA

PRODUCTION WANTED

WANTED TO BUY

Stripper or near-stripper production with water-flood possibilities—adequate acreage a necessity and enough wells to justify investigation.

BOX M-278
THE OIL AND GAS JOURNAL
TULSA, OKLAHOMA

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Exceeds Specifications

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Matamoros 562, Pte. Monterrey, México

BUSINESS OPPORTUNITIES

WANTED
NATURAL GASOLINE PLANTS
OR
PLANT SITUATIONS
BY
MEDIUM SIZED, PUBLICLY OWNED
CORPORATION WITH AMPLE CAPITAL

Box M-280, The Oil and Gas Journal, Tulsa, Oklahoma

OIL FIELD Trucking Business. New Mexico permits for Crude Oil, Water and Oil Field Equipment and Supplies. Will sell permits separately. Equipment in good condition. No excess equipment to purchase. Profitable operation. Will consider trade for real estate. Box M-279, The Oil and Gas Journal, Tulsa, Oklahoma.

FINANCIAL—Investment Banking Houses and Underwriters reached. Confidential. You can send the details of your proposition direct or thru your attorney to Consultant 817—51st Street, Brooklyn, N. Y.

LEASE AND DRILLING BLOCKS

WILL TRADE shallow producing oil lease for medium size Bucyrus Spudder. Sam Walker, Archer City, Texas. Telephone HO-2-5424.

40 ACRES Montgomery County, Kansas, diagonal off-set to new wildcat discovery, Peru Sand well. 500 ft. deep, ⅜ interest for sale $375.00 per ⅛th to drill No. 1. Reply: Box M-268, The Oil and Gas Journal, Tulsa, Oklahoma.

OHIO AND WEST VIRGINIA acreage for sale close to Big Play. Specialize in 10-15 thousand acre blocks or will lease on your form anywhere in the East. David Law, 716 Union Trust Bldg., Parkersburg, West Virginia. Phone: HU 5-6446.

PENNSYLVANIA OIL PROPERTY

265 Acres in fee, Venango County, 4,500 bbls. ($4.52 crude) annually from three formations under 1,000 ft. Core saturation of 3rd Sand 9,500 bbls. per acre. $30,000 to $40,000 capital expenditure would double production—ideal for large development. 100 acres standing timber. For full information write:

George N. Foggan Estate
South Side Station, Box 855
Oil City, Pennsylvania

BUSINESS OPPORTUNITIES

LEASE AND DRILLING BLOCKS

160 acre oil lease, Osage County, Oklahoma. Good Geology, shallow drilling. Box M-282, The Oil and Gas Journal, Tulsa, Oklahoma.

WANT TO PURCHASE Gas and Oil Properties—Submit Reserve Estimates, Income, etc. Box M-210, The Oil and Gas Journal, Tulsa, Oklahoma.

BARTLESVILLE SAND Production several locations to drill. Will consider part payment in oil. Age and health reason for selling. Arthur Lyke, Eureka, Kansas.

OIL AND GAS LEASE
approx.
600,000 acres

For participation or sale—covering the entire coastline of a southeastern coastal state on their entire tidelands and marshlands.

Strong potential for gas and oil discovery. Excellent geology.

Do not respond unless financially able to engage in this type exploration. Owner.

Box M-252
The Oil and Gas Journal
Tulsa, Oklahoma

NOTICE

SALE OF OIL AND GAS MINING LEASES TRIBAL AND ALLOTTED INDIAN LANDS SALE NO. 12

UNITED STATES DEPARTMENT OF THE INTERIOR
BUREAU OF INDIAN AFFAIRS
Crow Indian Agency
Crow Agency, Montana

Sealed bids will be received until February 16, 1961, 2:00 o'clock, P.M., Mountain Standard Time, and opened at that time in the office of the Crow Indian Agency, Crow Agency, Montana, for the leasing of 5,280.00 acres of tribal land and 1,320.00 acres of allotted lands all located in Twp. 6 South, Rge. 32 East, Big Horn County, Montana, for oil and gas mining purposes. The details of the lease offering and how and where to file bids may be obtained by addressing the inquiry to the Superintendent of Crow Indian Agency, at Crow Agency, Montana.

OIL AND GAS JOURNAL
Box 1260
TULSA, OKLAHOMA

Please check one so we can be of more help to you.

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- ☐ We want equipment.
- ☐ Need personnel.
- ☐ Want new job.
- ☐ Buy, sell leases or royalties.
- Other ☐ _____

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NAME _____ TITLE _____
COMPANY _____
ADDRESS _____
CITY _____ ZONE ____ STATE _____

LEASE AND DRILLING BLOCKS

CUMBERLAND COUNTY Kentucky—600 acre lease near new shallow well flowing 400 barrels per day. Price $3.50 per acre. Small override. Write, write, phone. W. V. Cravens. Russell Springs, Kentucky.

HAVE COMPLETED two good producers from Bartlesville sand. 920'. Montgomery County, Kansas. Moving to nearby 80 acres. Need additional capital 1/8 interest for sale at $600 per 1/8 interest. For particulars write: S & M Drilling & Production Co., Box 59, Cherryvale, Kansas.

OIL LEASE CRANE County, Texas: Available S/239 acres, Section 13, Block B-28, PSL, two miles from new gas discovery Section 23, Blk. 4, H&TC, Hill & Meeker well. Quick action, address landowner: Jefferson G. Smith, 715 Littlefield Building, Austin 15, Texas.

BUSINESS SERVICE

INVENTORS

Do you want your drilling or production speciality or process developed and marketed? Either patented or applied for. Describe briefly; mail to Box M-259, The Oil and Gas Journal, Tulsa, Oklahoma. If interested, principal will negotiate; if not, will promptly advise.

WESTERN CANADIAN sales firm interested in representing U. S. and foreign manufacturers of production equipment. Well established, highest references, Write: Box M-276, The Oil and Gas Journal, Tulsa, Oklahoma.

DELAWARE CORPORATION formed and serviced. American Guaranty & Trust Company. P. O. Box 487, Wilmington, Delaware

CLIENTS WANTED

Expanding Tulsa consulting engineering firm desires additional clients. Our staff of registered professional engineers offers complete oil field engineering service: Exploration (geological, seismic, radioactivity), Mapping, Drilling-Completion-Production Supervision, Reservoir and Property Evaluations, Property Acquisition and Sale. We can serve as your engineering department and field force or augment your present one—anywhere, anytime—per diem, retainer, or contract. We welcome inquiries from responsible principals—strictest confidences practiced.

Box M-240, The Oil and Gas Journal
Tulsa, Oklahoma

LEGAL

U. S. DEPARTMENT OF THE INTERIOR, Bureau of Land Management, Washington 25, D. C. Notice is hereby given that approximately 40 acres of land in one parcel within the known geologic structure of a producing oil or gas field, undefined, in Allegan County, Michigan, will be offered for competitive oil and gas leasing through sealed bids to the qualified bidder of the highest cash amount per acre at 1:00 P.M., E.S.T. March 22, 1961, when bids will be opened. Full details of the lease offering, and how and where to submit bids, may be obtained from the Manager, Eastern States Land Office, Bureau of Land Management, Washington 25, D. C. H. K. Scholl, Manager.

LEGAL

U. S. DEPARTMENT OF THE INTERIOR, Bureau of Land Management, Washington 25, D. C. Notice is hereby given that approximately 360.06 acres of land in three parcels within the known geologic structure of the Lake Bistineau Field, Louisiana, will be offered for competitive oil and gas leasing through sealed bids to the qualified bidder of the highest cash amount per acre at 1:00 P.M., E.S.T. March 15, 1961, when bids will be opened. Full details of the lease offering, and how and where to submit bids, may be obtained from the Manager, Eastern States Land Office, Bureau of Land Management, Washington 25, D. C. H. K. Scholl, Manager.

LEGAL

SEALED BIDS will be received until 10:00 A.M. Mountain Standard Time, February 23, 1961, and opened at that time in the office of the Navajo Indian Agency, Window Rock, Arizona, for oil and gas leases, on 56 tracts of tribal lands, totaling approximately 95,130.48 acres, located in San Juan County, New Mexico.
Details of the lease offering and filing of bids may be obtained by addressing an inquiry to the General Superintendent, Navajo Indian Agency, Attention: Branch of Realty, Window Rock, Arizona.

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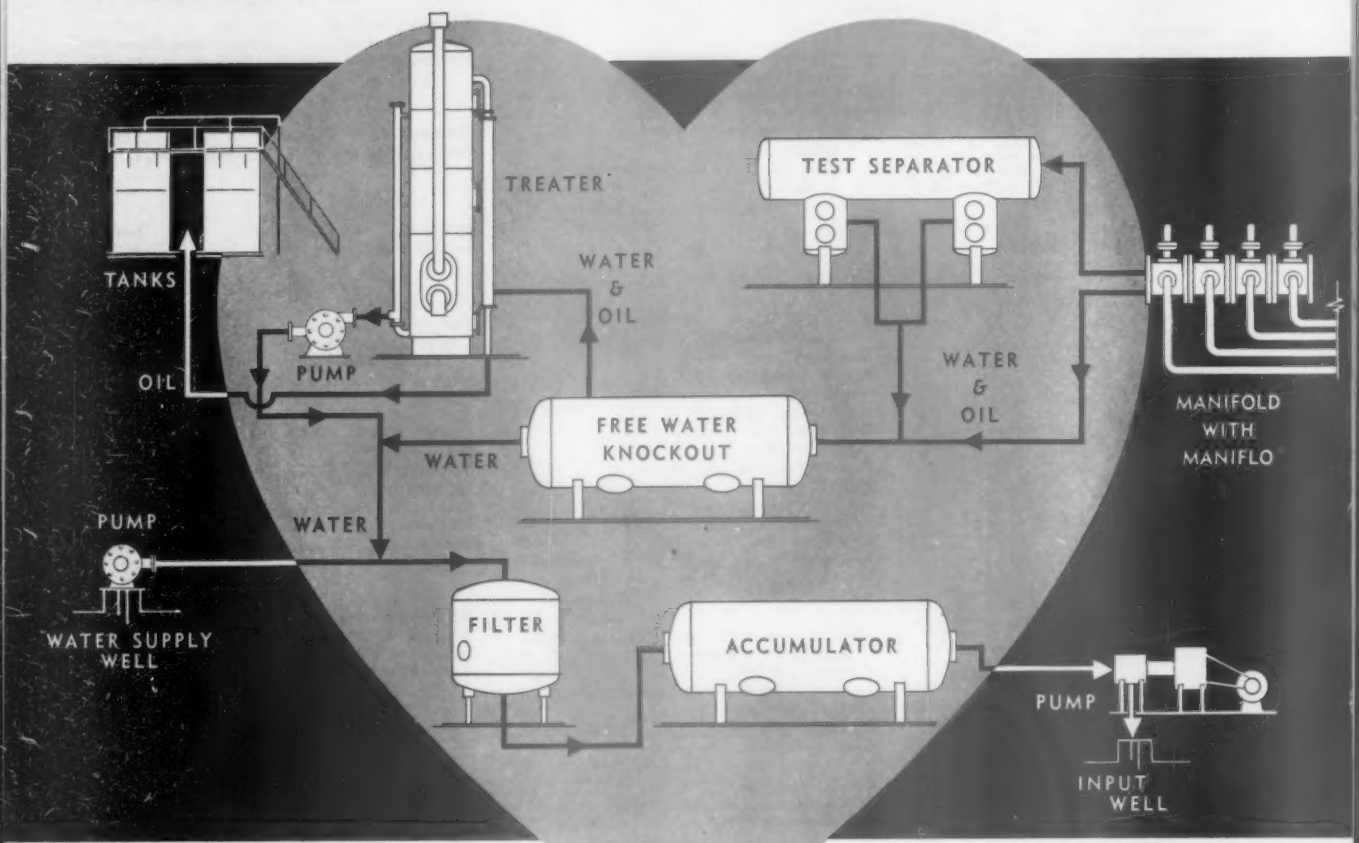

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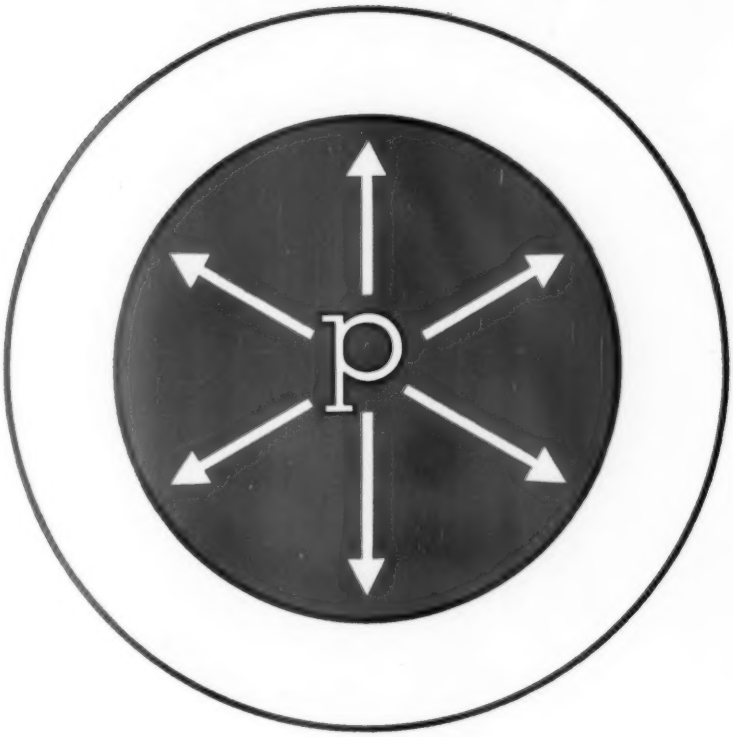
TULSA, OKLAHOMA



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